

# A Practical Guide to Programming HES Fixtures


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# A Practical Guide to Programming HES Fixtures

This book is intended to be a guide for programmers. The information contained herein describes the features and uses of each fixture. While the functions can be applied using any DMX controller, this book also has references to the Wholehog<sup>®</sup> II software (marked with ).

Good programmers must know everything about both their fixtures and their control console. This guide presents the reader with all the information needed to properly program fixtures from High End Systems<sup>®</sup>.

The guide will be updated as new fixtures are released.

 NOTE: Handshake<sup>™</sup> uses the Wholehog II libraries, therefore all library label notations in this guide for Wholehog II software refer to Handshake as well



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# Fixture Setup

- Data lines
  - Most data problems are due to bad data lines or adaptors. Be sure all cables are in good working order
  - It is possible to have a bad data line that will work for some fixtures and not others. It is also possible to have a bad data line that will still cause the receive LED on the fixture(s) to illuminate
- Termination
  - Be sure to terminate all data lines and outputs on data splitters. Use a 120 ohm .25 watt resistor between pins 2 & 3
  - Lack of termination problems can cause many errors including some fixtures working and other not. Also erratic data problems causing fixtures to react improperly
- Fixture menus / settings
  - All HES fixtures have the ability to set functions such as Invert pan and / or tilt, etc. Be sure to read the user's manual for a complete explanation of the settings. Usually it is better for the lighting controller to assign these functions (if possible)





# Understanding Mspeed

- Motor Speed (Mspeed) is used to control the time of the fixture's movement. When an Mspeed value is assigned the fixture will move at that assigned time. Certain functions (color changes, gobo changes) can also be assigned to move at the Mspeed
- Mspeed, when applied to several fixtures, allows each of the fixtures to reach their designated positions at a set time regardless of their starting position; all fixtures with the same Mspeed in a cue will arrive at their assigned end positions at the same time regardless of the speed that they actually travel to reach those points
- The **ONLY** way to have gobos/lithos change slowly is to assign them to Mspeed
- x.Spot is able to crossfade lithos and it is not necessary to use Mspeed
- Color wheels on some fixtures can be controlled via either crossfade (Continuous Mode) or Mspeed (Indexed Mode) Avoid using both at the same time as this will confuse the fixture.
  - Cyberlight, Intellabeam, and Trackspot color wheels **ONLY** change slowly via Mspeed.



# Understanding Mspeed

- Mspeed is not required for fixture movement and is best used for extremely slow movements. Console crossfading of pan and tilt is sufficient for most programming
  - When Mspeed is assigned, DO NOT crossfade the pan and tilt values. Have the pan and tilt change at a time of 0 so that the fixture can calculate the movement to match the assigned Mspeed ( If crossfade is applied to an Mspeed value, in effect it will multiply the amount of time the fixture will take to move; therefore, when using Mspeed always assign crossfade to 0 for *Pan, Tilt, and Mspeed channels* so that ONLY Mspeed is applied to the movement)
  - When using Mspeed, it is best to position the fixture then assign it an Mspeed value. If you adjust the *Mspeed channel* first, then the fixture will move slowly when you are trying to position it
  - Many of the newer fixtures have a setting called “speed off” in the *control channel*
    - “speedoff” disables the Mspeed setting from pan and tilt. Mspeed will then only affect parameters assigned to it (color, gobo)
-  Wholehog systems default to Mspeed at “xfade” (mspeed is disabled)
-  Using Highlight overrides the assigned Mspeed to 0 seconds

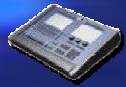
# Understanding Crossfading

- Parameters on fixtures are either continuous or indexed.
  - Continuous means they can stop at any value within the DMX range
  - Indexed (non-continuous) means they stop only at certain values within the DMX range
- Generally continuous items use crossfade from a console to change values at a specific time. Indexed items use Mspeed to change at time.
- Newer fixtures usually have a *mode channel* to assign either continuous or indexed (*color control channel*). Older fixtures (Cyberlight and Intellabeam) have their parameters preset to either continuous or indexed and can not be changed.



# Understanding Crossfading

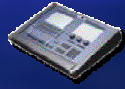
- Console crossfading
  - Most consoles default parameters to either change instantly or to crossfade at an assignable time
  - Refer to the console manual for more information about specific default settings



## Wholehog II fixture library

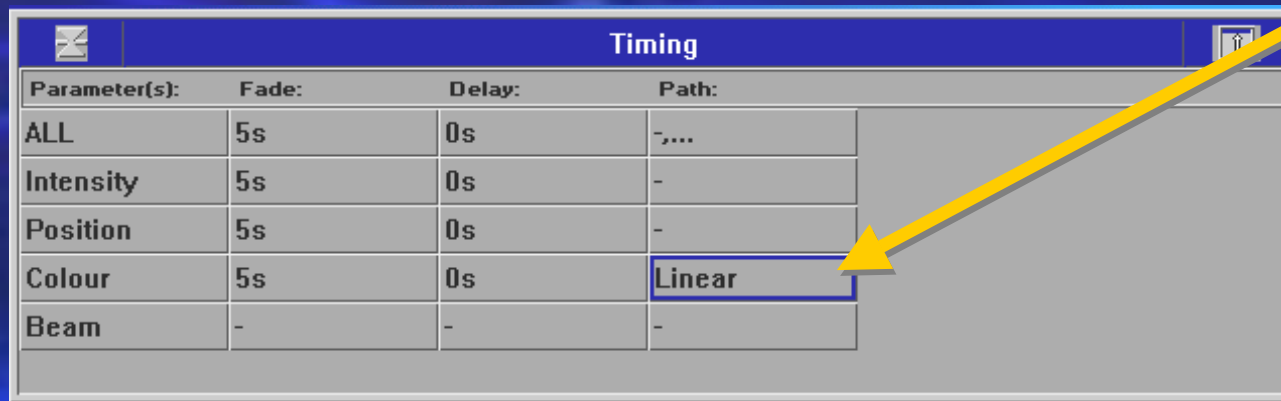
- The fixture library pre-defines parameter crossfade paths as either **linear** (crossfade-able) or **start** (instant change)
- Alter the path to change how the parameter will crossfade
- This guide shows the default path assignments for all parameters

# Understanding Crossfading



## Using Path on Wholehog II

- Change a parameter's Path in order to change how that parameter will crossfade from value to value
- TIP: if you set a crossfade time and the parameter does not follow the time, try changing the parameter's Path to **Linear** (assigned within the Time Window)
- Example:
  - Path for a Studio Spot 250 color wheel is defaulted to **Start** to allow the user to snap from one color to the other. However, to achieve a smooth crossfade of color wheel values the Path must be set to **Linear**



Parameter(s):	Fade:	Delay:	Path:
ALL	5s	0s	-,...
Intensity	5s	0s	-
Position	5s	0s	-
Colour	5s	0s	Linear
Beam	-	-	-



# Understanding Macros

Most HES fixtures have a Macro Channel. This channel has two uses depending upon fixture type:

## 1. Internal effects

- These items assist in programming by setting the fixture to common movements such as pans, tilts, circles, etc.

## 2. LAD<sup>®</sup> control

- Fixtures with a Laser Aiming Device installed will have control for the laser on the macro channel. Laser on, various strobe speeds, and Laser off are all available






**X**·spot



# x.Spot Details

- 38 DMX Channels
- Modules
  - Standard – 3 rotating litho wheels
  - LithoMotion – 2 rotating litho wheels plus litho motion
  - Shutters – 2 rotating litho wheels plus shutters
-  2 Banks of 16 On board presets
- Standard Lens is 12° - 45 ° (F2 4:1 zoom)
- Options
  - Future Modules

# x.Spot Movement


- 16 bit movement
  - Yoke
  - $640^{\circ} \times 255^{\circ}$
  - Use crossfade or Mspeed to control movement





# x.Spot CYM Colors





- CMY mixing
    - Use console crossfade to control times
    - 100% is white, 0% is full saturation
  - CTO
    - Fully variable with “beamflatner” on one end
  - CTB
    - Fully variable with “beamflatner” on one end
-  Wholehog II software default has this beamflatner in

① The “beamflatner” is a diffusion used to improve the evenness of the field. Without a “beamflatner” in, the x.Spot will be brighter, however the field will not be as flat and even. Two beamflatners are provided in the event of using either CTO or CTB (only one beamflatner is needed at a time)

# x.Spot CYM Colors



- Color Mix Control Channel
  - Modes for the CMY color mix channels
    -  Referred to as “col mod” on Wholehog software
  - Continuous – wheels can stop at any value from no saturation to full saturation
    -  Wholehog systems default to this mode
  - 2x Continuous – wheels can stop at any value from no saturation thru to full saturation and back to no saturation
  - Spin – rotates each color wheel at a speed determined by setting of that *color mix channel*
  - Cycle – cycle the color mixing wheels through a chase at a speed determined by setting of *cyan channel*
  - Scan – rotates each color wheel at a speed determined by setting of that *color mix channel*
  - Random - randomize the color mixing wheels through a chase at a speed determined by setting of *cyan channel*
  - Blink Indexed – Shutter closes during color change



# x.Spot CYM Colors



- Quick color bumps!
  - The color mix wheels of the Xspot operate in a “quickest path” mode. This means that when changing instantly from no color to full saturation, the wheel will turn backwards to the full saturation instead of going forward through all percentages of the color
  - When running very fast color chases (or rainbow effects) the fixture might begin to turn the wheels forward and backward. To correct this, place the *color mix control channel* in **2x continuous** mode and adjust the size of the effect or chase. This mode allows the wheels to dial through the saturation levels and back to open. The wheels do not operate as “quickest path” when using the **2x continuous** mode
  - Using **2x continuous** mode, split colors with the color mix wheels can be achieved

# x.Spot Colors



- 1 Fixed wheel with 5 colors plus open
  - Works with *color control channel* to change its function
    - 📀 Referred to as “colour” on Wholehog software
  - Continuous – use either crossfade or Mspeed
    - 📀 Wholehog software default path set to Start




# x.Spot Color Control



- Color Control Channel








Referred to as “colour <>” on Wholehog software

- Indexed – fixed color wheel will only stop on certain values (full and half colors)
- Continuous – fixed color wheel can stop at any value
  -  Wholehog systems default to this mode
- Spin – rotate the fixed color wheel at a speed determined by setting of *fixed color wheel channel*
- Fastscan – quickly scans between whole and half colors
- Slowscan – slowly scans between whole and half colors
- Random - randomize the color wheel through a chase at a speed determined by setting of *fixed color wheel channel*
- Blink Indexed – Closes shutter during color change



# x.Spot Patterns








- Litho Wheel 1 - 7 rotating Lithos plus open
  - Continuous – can crossfade between patterns
-  Path Defaults on Wholehog II set to Start
- Use ***Litho channel*** to select a pattern
  -  Referred to as “gobo” on Wholehog software
- Use ***Wheel control channel*** to select mode of the wheel
  -  Referred to as “gobo <>” on Wholehog software
- Use ***Litho control channel*** to select mode of the litho
  -  Referred to as “gobo mod” on Wholehog software
- Use ***Litho Rotate channel*** to select speed of the litho mode
  -  Referred to as “gobo rot” on Wholehog software



# x.Spot Patterns








- Litho Wheel 2 - 7 rotating Lithos plus open
  - Continuous – can crossfade between patterns
-  Path Defaults on Wholehog II set to Start
- Use ***Litho channel*** to select a pattern
  -  Referred to as “gobo 2” on Wholehog software
- Use ***Wheel control channel*** to select mode of the wheel
  -  Referred to as “gobo 2 <>” on Wholehog software
- Use ***Litho control channel*** to select mode of the litho
  -  Referred to as “gobo 2 mod” on Wholehog software
- Use ***Litho Rotate channel*** to select speed of the litho mode
  -  Referred to as “gobo 2 rot” on Wholehog software



# x.Spot Patterns



- Litho Wheel 3 - 7 rotating Lithos plus open
  - Continuous – can crossfade between patterns
-  Path Defaults on Wholehog II set to Start
- Use ***Litho channel*** to select a pattern
  -  Referred to as “fx/prism” on Wholehog software
- Use ***Wheel control channel*** to select mode of the wheel
  -  Referred to as “fx/prism<>” on Wholehog software
- Use ***Litho control channel*** to select mode of the litho
  -  Referred to as “fx/prism r” on Wholehog software
- Use ***Litho Rotate channel*** to select speed of the litho mode
  -  Referred to as “effect rot” on Wholehog software



# x.Spot Pattern Wheel Control



- 3 Litho Wheel Control Channels



Referred to as “gobo <>”, “gobo 2 <>”, and “fx/prism<>” on Wholehog software

- Indexed – indexed positioning of litho wheel, position set by *Litho channel*
- Continuous – continuous positioning of selected litho, position set by *Litho channel* – allows for crossfading between lithos without using mspeed



Wholehog systems default to this mode

- Spin fwd – forward rotate the entire litho wheel at a speed determined by setting of *Litho channel*
- Spin rev – reverse rotate the entire litho wheel at a speed determined by setting of *Litho channel*
- Scan – scan litho wheel at a position determined by setting of *Litho channel* (there is only one wheel scan speed)
- Random – random litho selections at a speed determined by setting of *Litho channel*
- Blink Wheel – Shutter closes during Litho change



# x.Spot Pattern Control



- 3 Litho Control Channels



Referred to as “gobo mod”, “gobo 2 mod”, and “fx/prism r” on Wholehog software

- Indexed – indexed positioning of selected litho, position set by *Litho Rotate channel*

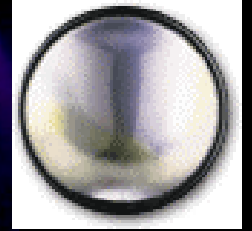





Wholehog systems default to this mode

- Rotate fwd – rotating of selected litho, speed set by *Litho Rotate channel*
- Rotate rev – rotating of selected litho, speed set by *Litho Rotate channel*
- Spin – rotate the entire litho wheel at a speed determined by setting of *Litho Rotate channel*
- Scan – scan selected litho at a speed determined by setting of *Litho Rotate channel*
- Blink Aperture – Shutter closes during aperture change



# x.Spot Beam Parameters



- Frost
  - Continuous – use crossfade to control speed
  - Frost Effects: strobe, ramps, random, etc
  -  Path Default on Wholehog II set to Linear
- Iris
  - Continuous – use crossfade to control speed
  - Iris Effects: strobe, ramps, random, etc
  -  Path Default on Wholehog II set to Linear
- Focus
  - Continuous – use crossfade to control speed
  -  Path Default on Wholehog II set to Linear

# x.Spot Strobe

- The *shutter channel* is used to open, close, and strobe the shutter



Wholehog II software refers to this channel as “strobe”



Path Default on Wholehog II set to Start

- Strobing options
  - Normal: 31 speeds
  - Random: 31 speeds
  - Ramps, snaps, randoms etc



# x.Spot Lamp Boost

- It is possible to boost and idle the lamp from any DMX console. Using the *Lamp control channel*, different lamp modes can be achieved. Using the modes, the lamp output can be boosted above 700 watts or idled down below 700 watts. Lamp Assisted strobing will boost the lamp only when the gate is open. This allows for fast strobing without any noticeable drop in light output.
- Below is a description of each mode and how they work:
  - **Lamp Assisted Strobes:** The standard periodic and random strobe functions are assisted. The ramping functions are not assisted.
  - **Lamp Functions:** These functions allow the lamp to strobe without the mechanical strobe. (See the DMX protocol)
  - **Lamp / Mechanical Dimming:** The lamp will vary from idle to normal wattage as the mechanical dimming ranges from 0% to 100% (using the *dim channel*)
  - **Lamp Only Dimming:** Only the lamp is dimmed from normal wattage to idle wattage (using the *dim channel*). Dimming will not go to black



# x.Spot Lamp Boost

- Use the *Lamp control channel* to assign a boost mode and the *shutter channel* and/or *dim channel* to set boost functions



The following boost modes are available in the *Lamp control channel*:

- **Lamp Assisted Strobes:** lampstb
- **Lamp Functions:** lampfnct
- **Lamp / Mechanical Dimming:** lampmech
- **Lamp Only Dimming:** lampdimg



When using the **lampfnct** mode, all values are available, however the strobe channel labeling will remain the same as other strobe functions (the boost and lightning settings will not be labeled, but can be found in the ramp ranges).



# x.Spot Control Channel

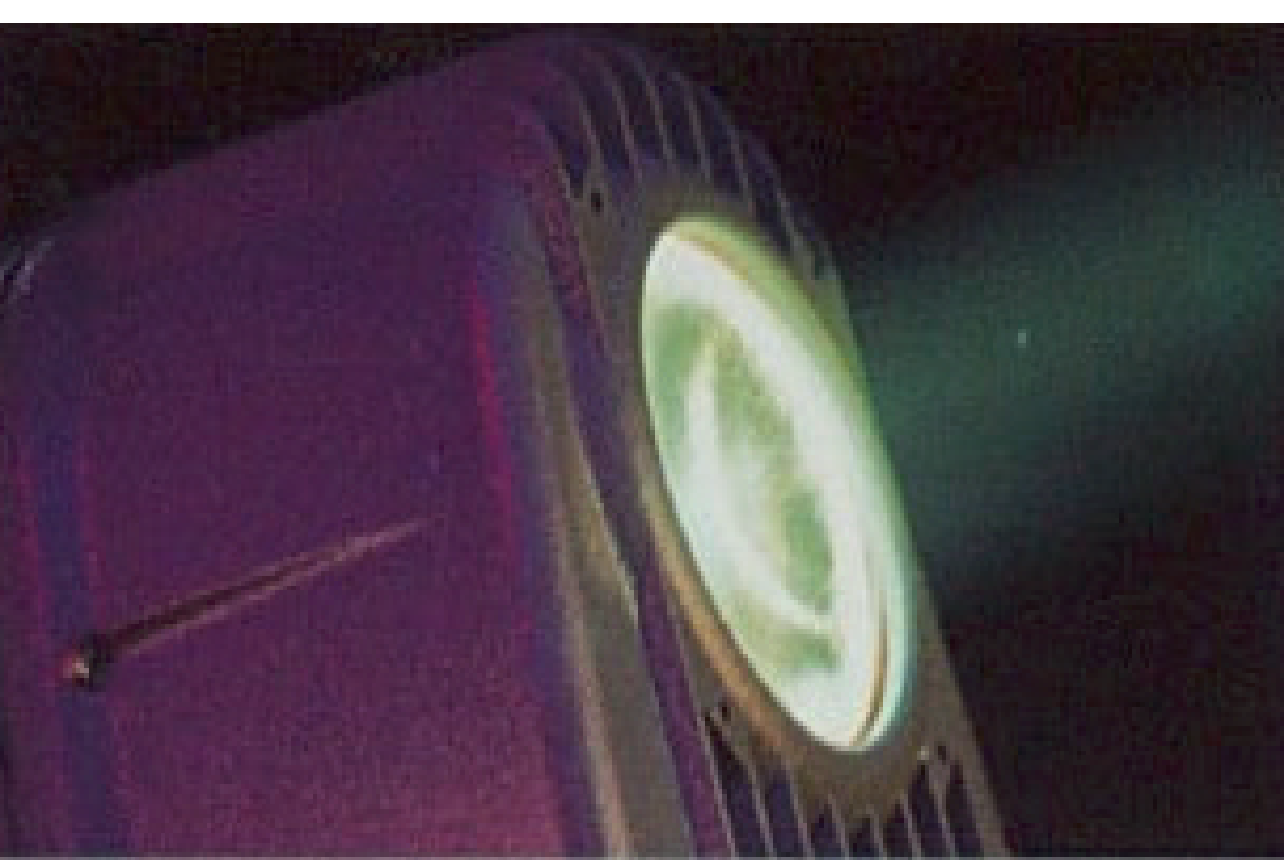


- The *shutter channel* must be set to Closed to access the **control channel**. The fixture must receive the control value for ½ a second to confirm the command.
- Set *shutter channel* to Closed (0%) and adjust *control channel* setting
  - Home – reset the fixture (it is also possible to home each module individually)
  - Shutdown (must send value for 2 seconds) – turn off fixture
  - Lamp On / Off – turn on / off lamp
  - Display off, bright, on – adjust LCD display
  - Speed off - disable Mspeed from pan and tilt



On Wholehog II systems, build a Home palette:

1. In the palette, set the *strobe* to Closed and set the *control channel* at Home
3. Select the fixture and press the palette. Leave the fixture at this setting for at least 3 seconds.
3. Be sure to clear the programmer or the palette otherwise the fixture will Home repeatedly



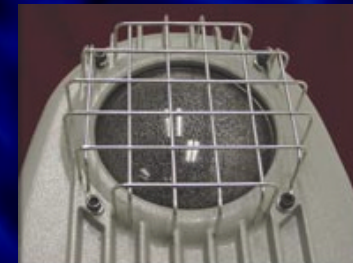
**EC-2**





# EC-2 Details

- 8 DMX Channels
- There are no menus or dipswitches, must use Handshake to access functions
- Lenses
  - narrow 18°-25°
  - medium 22°-29° (standard)
  - wide 28°-35°
- 2 banks of 16 On board presets
- Accessories
  - Glare Guard
  - Wire Lens Guard
  - Universal Cable Kit



# EC-2 CMY Colors



- CMY mixing
  - Use console crossfade to control times
  - 0% is white, 100% is full saturation



# EC-2 Color Control



- Color Control Channel



Referred to as “colour <>” on Wholehog software


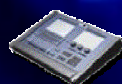
- Continuous – wheels can stop at any value (color mix and fixed)



Wholehog systems default to this mode

- Spin – rotates each color wheel at a speed determined by setting of that *color mix channel*
- Cycle – cycle the color mixing wheels through a chase at a speed determined by setting of *cyan channel*
- Scan – rotates each color wheel at a speed determined by setting of that *color mix channel*
- Random - randomize the color mixing wheels through a chase at a speed determined by setting of *cyan channel*
- Blink Indexed – Shutter closes during indexed color change

# EC-2 Strobe

- The *shutter channel* is used to open, close, and strobe the shutter
  -  Wholehog II software refers to this channel as “strobe”
  -  Path Default on Wholehog II set to Start
- Strobing options
  - Normal: 31 speeds
  - Random: 31 speeds
  - Ramps, snaps, randomness etc



# EC-2 Control Channel



- The *shutter channel* must be set to Closed to access the *control channel*. The fixture must receive the control value for ½ a second to confirm the command.
- Set *shutter channel* to Closed (0%) and adjust *control channel* setting
  - Home – reset the fixture
  - Shutdown (must send value for 2 seconds) – turn off fixture
  - Lamp On / Off – turn on / off lamp



On Wholehog II systems, build a Home palette:

1. In the palette, set the *strobe* to Closed and set the *control channel* at Home
3. Select the fixture and press the palette. Leave the fixture at this setting for at least 3 seconds.
3. Be sure to clear the programmer or the palette otherwise the fixture will Home repeatedly



**studio beam**



# Studio Beam Details

- 16 DMX Channels



- 2 Banks of 16 On board presets

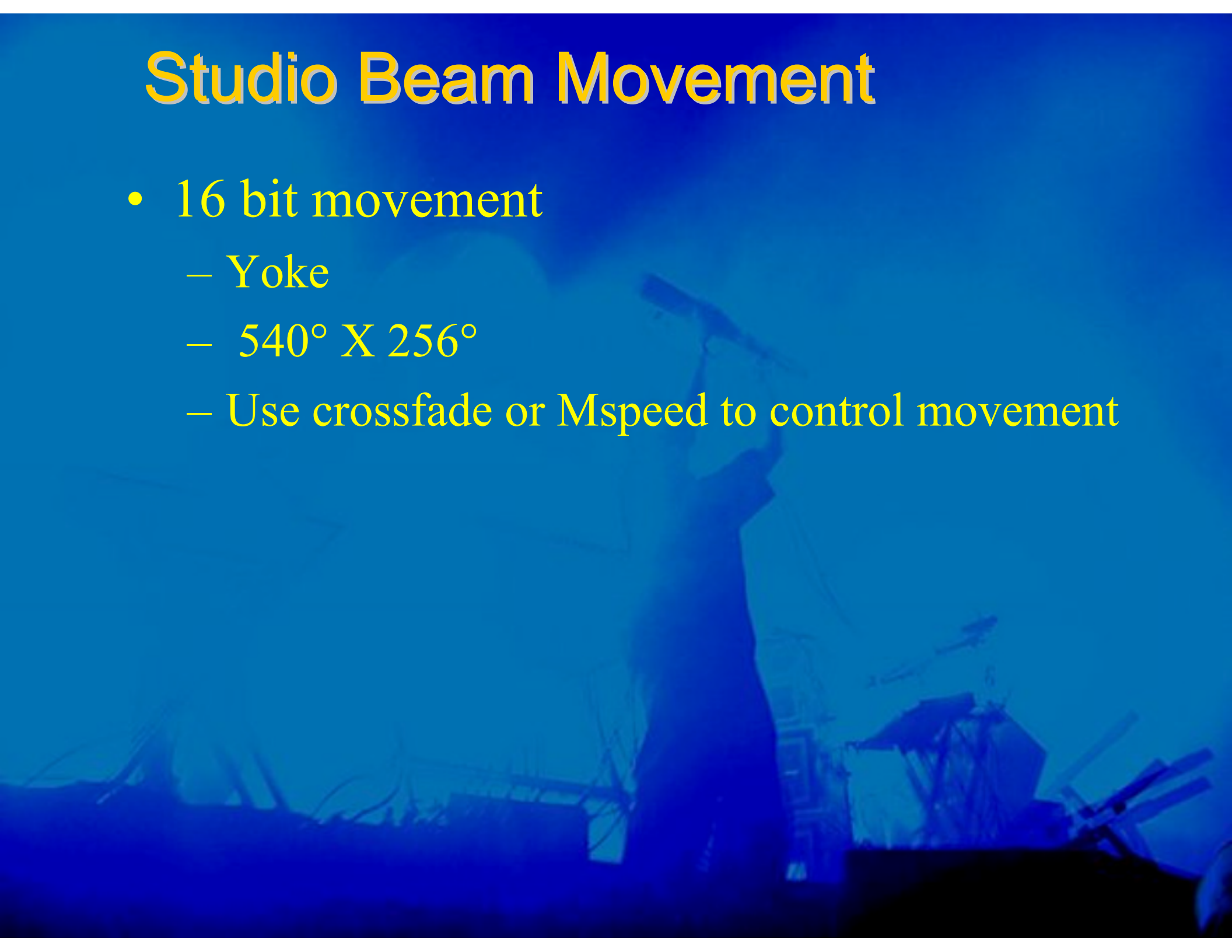
- Zoom Lens is 14° to 30°
- 14° with Zoom Lens removed

- Options

- Zoom Lens is easily removable

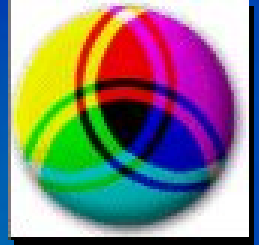
# Studio Beam Movement

- 16 bit movement
  - Yoke
  - $540^{\circ} \times 256^{\circ}$
  - Use crossfade or Mspeed to control movement

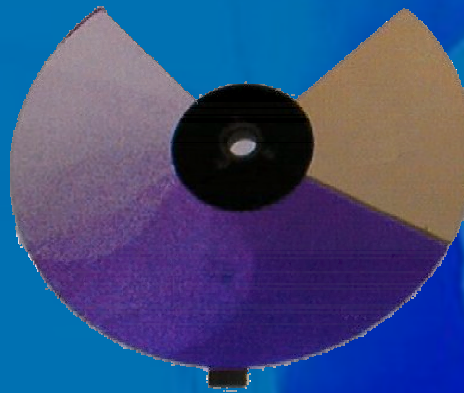




# Studio Beam Colors



- CMY mixing
  - Use console crossfade to control times
  - 100% is white, 0% is full saturation
- Unique wheels have both color mixing and 1 fixed color on each wheel

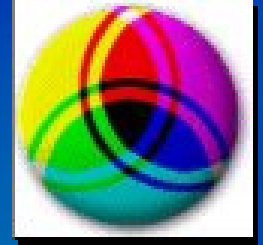


**Magenta Color Mix Wheel with Fixed CTO**



Auto-Menus create “pure mix” and “continuous” palettes for color mix modes. Continuous is the default setting

# Studio Beam Color Control



- Color Control Channel

 Referred to as “colour <>” on Wholehog software

- Indexed – wheels behave as an 8 position fixed color wheel (full and half colors)
- Continuous – wheels can stop at any value (color mix and fixed)



Wholehog systems default to this mode

Suggested

Pure Mix – access only color mix portion of each wheel

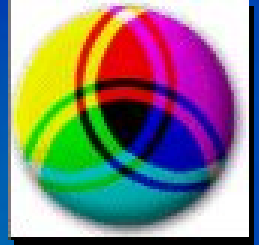
- Spin – rotates each color wheel at a speed determined by setting of that *color mix channel*
- Cycle – cycle the color mixing wheels through a chase at a speed determined by setting of *cyan channel*
- Scan – rotates each color wheel at a speed determined by setting of that *color mix channel*
- Random - randomize the color mixing wheels through a chase at a speed determined by setting of *cyan channel*
- Blink Indexed – Shutter closes during indexed color change



Wholehog systems must use Pure Mix for rainbow effect engine settings



# Studio Beam Colors



## *Color Mixing to a fixed color*

- Each color mix wheel on Studio Beam PC also has a fixed color attached. Color mixing to the fixed colors is possible

*For Example:* To color mix to the fixed Red color on the cyan wheel:

1. Bring in the Magenta and Yellow wheels slowly to crossfade to a red color
2. Turn the cyan wheel so it brings in the red color without passing though the cyan
3. Slowly remove the Magenta and Yellow to crossfade into the fixed red color

- The Cyan Wheel has a Red fixed color
- The Magenta Wheel has a CTO fixed color
- The Yellow Wheel has a Dark Blue fixed color

# Studio Beam Beam Shaping



- Beam Shaping

- Continuous – use crossfade to control speed
- Spin Effects – shaping spins forward and reverse



Referred to as “focus” on Wholehog software



Path Default on Wholehog II set to Start

- Frost



- Continuous – use crossfade to control speed
- Frost Effects: strobe, ramps, random, etc



Path Default on Wholehog II set to Linear



# Studio Beam Strobe

- The *shutter channel* is used to open, close, and strobe the shutter
  -  Wholehog II software refers to this channel as “strobe”
  -  Path Default on Wholehog II set to Start
- Strobing options
  - Normal: 31 speeds
  - Random: 31 speeds
  - Ramps, snaps, randoms etc

# Studio Beam Lamp Boost

- It is possible to boost and idle the lamp from any DMX console. Using the *control channel*, different lamp modes can be achieved. Using the modes, the lamp output can be boosted above 700 watts or idled down below 700 watts. Lamp Assisted strobing will boost the lamp only when the gate is open. This allows for fast strobing without any noticeable drop in light output.
- Below is a description of each mode and how they work:
  - **Lamp Assisted Strobes:** The standard periodic and random strobe functions are assisted. The ramping functions are not assisted.
  - **Lamp Functions:** These functions allow the lamp to strobe without the mechanical strobe. (See the DMX protocol)
  - **Lamp / Mechanical Dimming:** The lamp will vary from idle to normal wattage as the mechanical dimming ranges from 0% to 100% (using the *dim channel*)
  - **Lamp Only Dimming:** Only the lamp is dimmed from normal wattage to idle wattage (using the *dim channel*). Dimming will not go to black




# Studio Beam Lamp Boost

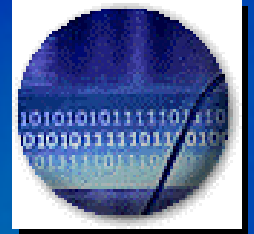
- Use the *control channel* to assign a boost mode and the *shutter channel* and/or *dim channel* to set boost functions

 The following boost modes are available in the control parameter:

- **Lamp Assisted Strobes:** lampstb
- **Lamp Functions:** lampfnct
- **Lamp / Mechanical Dimming:** lampmech
- **Lamp Only Dimming:** lampding

 When using the **lampfnct** mode, all values are available, however the strobe channel labeling will remain the same as other strobe functions (the boost and lightning settings will not be labeled, but can be found in the ramp ranges).

# Studio Beam Control Channel



- The *shutter channel* must be set to Closed to access the *control channel*. The fixture must receive the control value for ½ a second to confirm the command.
- Set *shutter channel* to Closed (0%) and adjust *control channel* setting
  - Home – reset the fixture
  - Shutdown (must send value for 2 seconds) – turn off fixture
  - Lamp On / Off – turn on / off lamp
  - Display off, bright, on – adjust LED display
  - Speed off - disable Mspeed from pan and tilt



On Wholehog II systems, build a Home palette:



1. In the palette, set the *strobe* to Closed and set the *control channel* at Home
3. Select the fixture and press the palette. Leave the fixture at this setting for at least 3 seconds.
3. Be sure to clear the programmer or the palette otherwise the fixture will Home repeatedly





**Color Pro**

# Color Pro Details

- 9 DMX Channels (enhanced mode)
  -  Wholehog software uses enhanced mode
- 6 DMX Channels (standard mode)
- Models
  - HX – Beam Shaping
  - Hx-i – Iris
  - FX – Fiber Optic, Flicker wheel
-  2 Banks of 16 On board presets



# Color Pro Manual Settings

- Zoom
  - Soft Wash -  $17^{\circ}$  to  $44^{\circ}$
  - Hard Edge -  $17^{\circ}$  to  $36^{\circ}$ 
    - Iris Model -  $3^{\circ}$  to  $36^{\circ}$
- Focus

# Color Pro CMY Colors



- CMY mixing
  - Use console crossfade to control times
  - 0% is white, 100% is full saturation
  - One fixed color (UV) is on the yellow wheel
    - To access the UV, do not use Pure Mix mode



# Color Pro Color Control



- Color Control Channel



Referred to as “colour <>” on Wholehog software

- Indexed – wheels behave as an 8 position fixed color wheel (full and half colors)
- Continuous – wheels can stop at any value (color mix and fixed)

Suggested

Pure Mix – access only color mix portion of each wheel



Wholehog systems default to this mode

- Spin – rotates each color wheel at a speed determined by setting of that *color mix channel*
- Cycle – cycle the color mixing wheels through a chase at a speed determined by setting of *cyan channel*
- Scan – rotates each color wheel at a speed determined by setting of that *color mix channel*
- Random - randomize the color mixing wheels through a chase at a speed determined by setting of *cyan channel*
- Blink Indexed – Shutter closes during indexed color change



Wholehog systems must use Pure Mix for rainbow effect engine settings



# Color Pro HX Beam Shaping



- Beam Shaping
  - Continuous – use crossfade to control speed
  - Frost – variable frost is first on the wheel
  - Spin Effects – shaping spins forward and reverse


 Referred to as “focus” on Wholehog software

 Path Default on Wholehog II set to Linear



# Color Pro HX-i Iris



- Iris
  - Continuous – use crossfade to control speed
  - Iris Effects – strobe, random, ramp, snap
  -  Path Default on Wholehog II set to Linear

# Color Pro FX



- Flicker Wheel
  - Continuous – use crossfade to control speed
  - Twinkle – wheel spins forward and reverse

 Referred to as “fx/prism” on Wholehog software

 Path Default on Wholehog II set to Linear

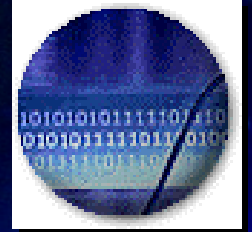


# Color Pro Strobe

- The *shutter channel* is used to open, close, and strobe the shutter
  -  Wholehog II software refers to this channel as “strobe”
  -  Path Default on Wholehog II set to Start
- Strobing options
  - Normal: 31 speeds
  - Random: 31 speeds
  - Ramps, snaps, randoms etc



# Color Pro Control Channel



- The *shutter channel* must be set to Closed to access the *control channel*. The fixture must receive the control value for ½ a second to confirm the command.
- Set *shutter channel* to Closed (0%) and adjust *control channel* setting
  - Home – reset the fixture
  - Shutdown (must send value for 2 seconds) – turn off fixture
  - Lamp On / Off – turn on / off lamp
  - Display off, bright, on – adjust LED display



On Wholehog II systems, build a Home palette:

1. In the palette, set the *strobe* to Closed and set the *control channel* at Home
3. Select the fixture and press the palette. Leave the fixture at this setting for at least 3 seconds.
3. Be sure to clear the programmer or the palette otherwise the fixture will Home repeatedly





STUDIO  
250



STUDIO SPOT 250

# Studio Spot 250 Details

- 18 DMX Channels



- 2 Banks of 16 On board presets

- Standard Lens is 18°

- Options

- 27° lens

- 40° lens



- LAD – Laser Aiming Device



# Studio Spot 250 Movement

- 16 bit movement
  - Yoke
  - $540^{\circ} \times 270^{\circ}$
  - Use crossfade or Mspeed to control movement



# Studio Spot 250 Colors



- 1 Fixed wheel with 12 colors plus open
  - Works with *color control channel* to change its function
  - Continuous – use either crossfade or Mspeed
    - 💻 Mspeed values displayed with \* on Wholehog software (example: \*indigo)
    - 💻 Path Default on Wholehog II set to Start




# Studio Spot 250 Color Control



- Color Control Channel








Referred to as “colour <>” on Wholehog software

- Indexed – fixed color wheel will only stop on certain values (full and half colors)
- Continuous – fixed color wheel can stop at any value
  -  Wholehog systems default to this mode
- Spin – rotate the fixed color wheel at a speed determined by setting of *fixed color wheel channel*
- Scan – scans between whole and half colors
- Random - randomize the color wheel through a chase at a speed determined by setting of *fixed color wheel channel*
- Blink Indexed – Shutter closes during color change

# Studio Spot 250 Patterns



- 1 wheel with 7 rotating Lithos plus open
  - Not continuous – must use Mspeed to change slowly
    -  Mspeed values assigned with **Gobo Mod** and displayed with \* on Wholehog software (example: \*>>)
- Use *Litho channel* to select pattern
  -  Referred to as “gobo” on Wholehog II software
- Use *Litho control channel* to select mode
  -  Referred to as “gobo mod” on Wholehog II software
- Use *Litho Rotate channel* to select speed of the mode
  -  Referred to as “gobo rot” on Wholehog II software
  -  Path Default on Wholehog II set to Start




# Studio Spot 250 Pattern Control







- Litho Control Channel



Referred to as “gobo mod” on Wholehog software

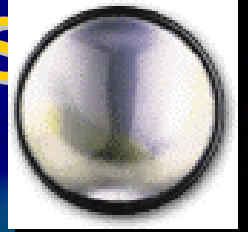
- All the following modes are repeated in Mspeed versions as well
  - Indexed – indexed positioning of selected litho, position set by *Litho Rotate channel*
    -  Wholehog systems default to this mode
  - Rotate fwd – rotating of selected litho, speed set by *Litho Rotate channel*
  - Rotate rev – rotating of selected litho, speed set by *Litho Rotate channel*
  - Spin – rotate the entire litho wheel at a speed determined by setting of *Litho Rotate channel*
  - Scan – scan selected litho at a speed determined by setting of *Litho Rotate channel*
  - Random – randomly choose lithos at a speed determined by setting of *Litho Rotate channel*
  - Blink Wheel – Shutter closes during litho change
  - Blink Aperture – Blacks out during aperture change



# Studio Spot 250 Effects

- 1 wheel with 4 rotating effects plus open
  - Not continuous – must use Mspeed to change slowly
    -  Mspeed values displayed with \* on Wholehog software (example:\*prism)
- Use *effects channel* to select pattern
  -  Referred to as “fx/prism” on Wholehog II software
- Use *effects rotate channel* to select mode
  - Forward rotate at variable speeds
  - Reverse rotate at variable speeds
  -  Referred to as “fx/prism<>” on Wholehog II software
  -  Path Default on Wholehog II set to Start


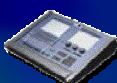


# Studio Spot 250 Beam Parameters



- Iris
  - Continuous – use crossfade to control speed
  - Iris Effects – strobe, random, ramp, snap
  -  Path Default on Wholehog II set to Linear
- Focus
  - Continuous – use crossfade to control speed
  -  Path Default on Wholehog II set to Linear

# Studio Spot 250 Strobe

- The *shutter channel* is used to open, close, and strobe the shutter
  -  Wholehog II software refers to this channel as “strobe”
  -  Path Default on Wholehog II set to Start
- Strobing options
  - Normal: 31 speeds
  - Random: 31 speeds
  - Ramps, snaps, randoms etc



# Studio Spot 250 Control Channel



- The *shutter channel* must be set to Closed to access the *control channel*. The fixture must receive the control value for ½ a second to confirm the command.
- Set *shutter channel* to Closed (0%) and adjust *control channel* setting
  - Home – reset the fixture
  - Shutdown (must send value for 2 seconds) – turn off fixture
  - Lamp On / Off – turn on / off lamp
  - Display off, bright, on – adjust LED display
  - Speed off - disable Mspeed from pan and tilt



On Wholehog II systems, build a Home palette:

1. Set the *strobe* to Closed and set the *control channel* at Home
3. Select the fixture and press the palette. Leave the fixture at this setting for at least 3 seconds.
3. Be sure to clear the programmer or the palette otherwise the fixture will Home repeatedly



STUDIO COLOR 250



# Studio Color 250 Details

- 15 DMX Channels

-  2 Banks of 16 On board presets

- Standard Lens is 11° to 14°

- Options

-  LAD – Laser Aiming Device

# Studio Color 250 Movement

- 16 bit movement
  - Yoke
  - $540^{\circ} \times 270^{\circ}$
  - Use crossfade or Mspeed to control movement

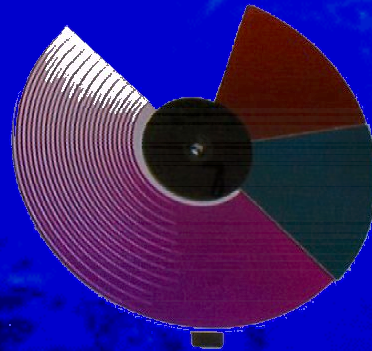




# Studio Color 250 Colors



- CMY mixing
  - Use console crossfade to control times
  - 100% is white, 0% is full saturation
- Unique wheels have both color mixing and fixed colors on one wheel; there is no additional fixed color wheel



**Magenta Color Mix Wheel with Fixed Aqua and Red**




Auto-Menus create “pure mix” and “continuous” palettes for color mix modes. Continuous is the default setting

# Studio Color 250 Color Control



- Color Control Channel

 Referred to as “colour <>” on Wholehog software

- Indexed – wheels behave as an 8 position fixed color wheel (full and half colors)
- Continuous – wheels can stop at any value (color mix and fixed)

 Wholehog systems default to this mode

Suggested

→ Pure Mix – access only color mix portion of each wheel

- Spin – rotates each color wheel at a speed determined by setting of that *color mix channel*
- Cycle – cycle the color mixing wheels through a chase at a speed determined by setting of *cyan channel*
- Scan – rotates each color wheel at a speed determined by setting of that *color mix channel*
- Random - randomize the color mixing wheels through a chase at a speed determined by setting of *cyan channel*
- Blink Indexed – Shutter closes during indexed color change

 Wholehog systems must use Pure Mix for rainbow effect engine settings to work properly



# Studio Color 250 Color Control

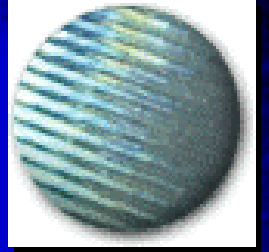


- Pure Mix mode
  - Pure mix mode is used to emulate traditional color mixing wheels (without fixed colors attached)
  - When in pure mix mode, the fixed colors can not be accessed
- Continuous mode
  - Continuous mode is used to allow each color wheel to stop at any value. This is crossfade-able and will allow for access to the fixed colors

 Auto-Menus create “pure mix” and “continuous” palettes for color mix modes. Continuous is the default setting

 Wholehog systems must use Pure Mix for rainbow effect engine settings



# Studio Color 250 Beam Shaping



- Beam Shaping
  - Continuous – use crossfade to control speed
  - Spin Effects – shaping spins forward and reverse
  - 📀 Referred to as “focus” on Wholehog software
  - 📀 Path Default on Wholehog II set to Linear



# Studio Color 250 Strobe

- The *shutter channel* is used to open, close, and strobe the shutter
  -  Wholehog II software refers to this channel as “strobe”
  -  Path Default on Wholehog II set to Start
- Strobing options
  - Normal: 31 speeds
  - Random: 31 speeds
  - Ramps, snaps, randoms etc

# Studio Color 250 Control Channel



- The *shutter channel* must be set to Closed to access the *control channel*. The fixture must receive the control value for  $\frac{1}{2}$  a second to confirm the command.
- Set *shutter channel* to Closed (0%) and adjust *control channel* setting
  - Home – reset the fixture
  - Shutdown (must send value for 2 seconds) – turn off fixture
  - Lamp On / Off – turn on / off lamp
  - Display off, bright, on – adjust LED display
  - Speed off - disable Mspeed from pan and tilt



On Wholehog II systems, build a Home palette:


1. In the palette, set the *strobe* to Closed and set the *control channel* at Home
3. Select the fixture and press the palette. Leave the fixture at this setting for at least 3 seconds.
3. Be sure to clear the programmer or the palette otherwise the fixture will Home *repeatedly*





**STUDIO SPOT 575**

# Studio Spot 575 Details

- 24 DMX Channels
- Models
  - Standard – fixed color wheels
  - CYM – color mixing
  - ES-1 – no movement (20 DMX channels)
-  2 Banks of 16 On board presets
- Standard Lens is 18°
- Options
  - 13° narrow lens
  - 30° wide lens







# Studio Spot 575 Movement

- 16 bit movement
  - Yoke
  - $370^{\circ} \times 255^{\circ}$
  - Use crossfade or Mspeed to control movement

# Studio Spot 575 Colors



- 2 Fixed wheels each with 5 colors plus open
  - Works with *color control channel* to change its function
  - Continuous – use either crossfade or Mspeed
    -  Mspeed values displayed with \* on Wholehog software (example: \*indigo)
    -  Path Default on Wholehog II set to Start




# Studio Spot 575 Color Control



- 2 Color Control Channels




Referred to as “colour <>” on Wholehog software

- Indexed – fixed color wheel will only stop on certain values (full and half colors)
- Continuous – fixed color wheel can stop at any value
  -  Wholehog systems default to this mode
- Spin – rotate the fixed color wheel at a speed determined by setting of *fixed color wheel channel*
- Scan – scans between whole and half colors
- Random - randomize the color wheel through a chase at a speed determined by setting of *fixed color wheel channel*
- Blink Indexed – Closes shutter during color change
- Combined (*color 2 control* only) – causes *color 1 channel* and *color 1 control channel* to affect both color wheels

# Studio Spot 575 CYM Colors









- CMY mixing
    - Use console crossfade to control times
    - 100% is white, 0% is full saturation
    - When all three CMY channels are at 0%, the fixture will be dimmed out
  - Color Control Channel
    - Modes To Be Determined
      -  Referred to as “colour <>” on Wholehog software
- ① Note: The CMY Mode can be assigned at the fixture’s menu. Fast mode allows for quick color changes, while slow is the default.
- On the fixture’s menu select **SET**, then **CMY** then **FAST** or **SLOW**



# Studio Spot 575 Patterns



- 2 wheels each with 5 rotating Lithos plus open
  - Not continuous – must use Mspeed to change slowly
    -  Mspeed values assigned with Gobo Mod and displayed with \* on Wholehog software (example: \*>>)
- Use *Litho channel* to select pattern
  -  Referred to as “gobo” on Wholehog software
- Use *Litho control channel* to select mode
  -  Referred to as “gobo mod” on Wholehog software
- Use *Litho Rotate channel* to select speed of the mode
  -  Referred to as “gobo rot” on Wholehog software
  -  Path Default on Wholehog II set to Start
-  TIP: use the Mspeed Off setting in the *control channel* to allow mspeed to control only the lithos and not the pan and tilt




# Studio Spot 575 Pattern Control



- 2 Litho Control Channels

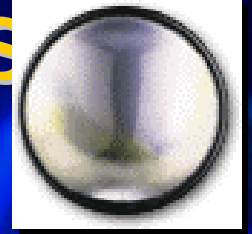





Referred to as “gobo mod” on Wholehog software

- All the following modes are repeated in Mspeed versions as well
  - Indexed – indexed positioning of selected litho, position set by *Litho Rotate channel*
    -  Wholehog systems default to this mode
  - Rotate fwd – rotating of selected litho, speed set by *Litho Rotate channel*
  - Rotate rev – rotating of selected litho, speed set by *Litho Rotate channel*
  - Spin – rotate the entire litho wheel at a speed determined by setting of *Litho Rotate channel*
  - Scan – scan selected litho at a speed determined by setting of *Litho Rotate channel*
  - Random – randomly choose Lithos at a speed determined by setting of *Litho Rotate channel*
  - Blink Wheel – Shutter closes during litho change
  - Blink Aperture – Shutter closes during aperture change





# Studio Spot 575 Beam Parameters



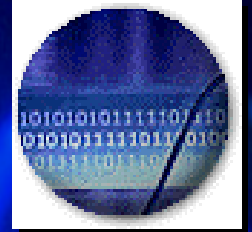
- Frost
  - Continuous – use crossfade to control speed
  - Frost Effects: strobe, ramps, random, etc
  -  Path Default on Wholehog II set to Linear
- Iris
  - Continuous – use crossfade to control speed
  - Iris Effects: strobe, ramps, random, etc
  -  Path Default on Wholehog II set to Linear
- Focus
  - Continuous – use crossfade to control speed
  -  Path Default on Wholehog II set to Linear

# Studio Spot 575 Strobe

- The *shutter channel* is used to open, close, and strobe the shutter
  -  Wholehog II software refers to this channel as “strobe”
  -  Path Default on Wholehog II set to Start
- Strobing options
  - Normal: 31 speeds
  - Random: 31 speeds
  - Ramps, snaps, randoms etc



# Studio Spot 575 Control Channel



- The *shutter channel* must be set to Closed to access the **control channel**. The fixture must receive the control value for ½ a second to confirm the command.
- Set *shutter channel* to Closed (0%) and adjust *control channel* setting
  - Home – reset the fixture
  - Shutdown (must send value for 2 seconds) – turn off fixture
  - Lamp On / Off – turn on / off lamp
  - Display off, bright, on – adjust LED display
  - Speed off - disable Mspeed from pan and tilt



On Wholehog II systems, build a Home palette:

1. In the palette, set the *strobe* to Closed and set the *control channel* at Home
3. Select the fixture and press the palette. Leave the fixture at this setting for at least 3 seconds.
3. Be sure to clear the programmer or the palette otherwise the fixture will Home repeatedly



**TECHNOBEAM™**



# Technobeam Details

- 18 DMX Channels (14 in reduced mode)
- Models

- Standard – older silver label model
- Iris – black label model

Note: if the fixture has the Iris installed, the protocol is different and requires a different fixture library



- 8 or 16 On board presets depending on model

- Standard Lens is 11° to 17°
  - Default is 15°
  - Manually adjusted

- Options

- 8° to 12° Narrow Lens Set
- 30° Wide Lens Set
- Iris – optional on black label models only



- LAD – Laser Aiming Device

# Technobeam Movement

- 16 bit movement
  - mirror
  - $173^{\circ} \times 95^{\circ}$
  - Use crossfade or Mspeed to control movement

① Note: The Pan and Tilt maximum speed can be assigned at the fixture's menu. Fast mode allows for faster mirror movements, while slow is the default.

- On the fixture's menu select **SET**, then **FAST** then **ON** or **OFF**



# Technobeam Colors



- 1 Fixed wheel with 12 colors plus open
  - Works with *color control channel* to change its function
  - Continuous – use either crossfade or Mspeed
    - 💿 Mspeed values displayed with \* on Wholehog software (example: \*indigo)
    - 💿 Path Default on Wholehog II set to Start


# Technobeam Color Control



- Color Control Channel





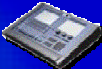


Referred to as “colour <>” on Wholehog software

- Indexed – fixed color wheel will only stop on certain values (full and half colors)
- Continuous – fixed color wheel can stop at any value
  -  Wholehog systems default to this mode
- Spin – rotate the fixed color wheel at a speed determined by setting of *fixed color wheel channel*
- Scan – scans between whole and half colors
- Random - randomize the color wheel through a chase at a speed determined by setting of *fixed color wheel channel*



# Technobeam Patterns



- 1 wheel with 7 rotating Lithos plus open
  - Not continuous – must use Mspeed to change slowly
    -  Mspeed values assigned with Gobo Mod and displayed with \* on Wholehog software (example: \*>>)
- Use *Litho channel* to select pattern
  -  Referred to as “gobo” on Wholehog II software
- Use *Litho control channel* to select mode
  -  Referred to as “gobo mod” on Wholehog II software
- Use *Litho Rotate channel* to select speed of the mode
  -  Referred to as “gobo rot” on Wholehog II software
  -  Path Default on Wholehog II set to Start

Note: Non-Iris Technobeam uses 16 bit positioning for litho rotation. Iris Technobeam uses 8 bit


# Technobeam Pattern Control



- Litho Control Channel







Referred to as “gobo mod” on Wholehog software

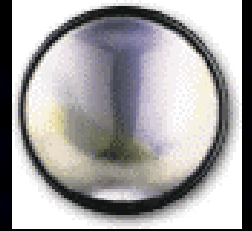
- All the following modes are repeated in mspeed versions as well
  - Indexed – indexed positioning of selected litho, position set by *Litho Rotate channel*
    -  Wholehog systems default to this mode
  - Rotate fwd – rotating of selected litho, speed set by *Litho Rotate channel*
  - Rotate rev – rotating of selected litho, speed set by *Litho Rotate channel*
  - Spin – rotate the entire litho wheel at a speed determined by setting of *Litho Rotate channel*
  - Scan – scan selected litho at a speed determined by setting of *Litho Rotate channel*
  - Random – randomly choose lithos at a speed determined by setting of *Litho Rotate channel*



# Technobeam Effects

- 1 wheel with 4 rotating effects plus open
  - Not continuous – must use Mspeed to change slowly
    -  Mspeed values displayed with \* on Wholehog software (example: \*prism)
- Use *effects channel* to select pattern
  -  Referred to as “fx/prism” on Wholehog II software
- Use *effects rotate channel* to select mode
  - Forward rotate at variable speeds
  - Reverse rotate at variable speeds
    -  Referred to as “fx/prism<>” on Wholehog II software
    -  Path Default on Wholehog II set to Start

# Technobeam Beam Parameters



- Iris

- Continuous – use crossfade to control speed
- Iris Effects – strobe, random, ramp, snap



Path Default on Wholehog II set to Linear

- Focus



- Continuous – use crossfade to control speed



Path Default on Wholehog II set to Linear



# Technobeam Strobe

- The *shutter channel* is used to open, close, and strobe the shutter
  -  Wholehog II software refers to this channel as “strobe”
  -  Path Default on Wholehog II set to Start
- Strobing options
  - Normal: 31 speeds
  - Random: 31 speeds
  - Ramps, snaps, randoms etc

# Technobeam Control Channel



- The *shutter channel* must be set to Closed to access the **control channel**. The fixture must receive the control value for  $\frac{1}{2}$  a second to confirm the command.
- Set *shutter channel* to Closed (0%) and adjust *control channel* setting
  - Home – reset the fixture
  - Shutdown (must send value for 2 seconds) – turn off fixture
  - Lamp On / Off – turn on / off lamp
  - Display off, bright, on – adjust LED display
  - Speed off - disable Mspeed from pan and tilt



On Wholehog II systems, build a Home palette:

1. In the palette, set the *strobe* to Closed and set the *control channel* at Home
3. Select the fixture and press the palette. Leave the fixture at this setting for at least 3 seconds.
3. Be sure to clear the programmer or the palette otherwise the fixture will Home repeatedly





**STUDIO COLOR® 575**

# Studio Color 575 Details

- 16 DMX Channels
- Models
  - Studio Color M – original, non-switching power supply
  - Studio Color S – switching power supply
  - Studio Color 575 – Switching power supply, curved yoke design
  - EC-1 – no movement (12 DMX channels)
- 0 or 16 On-board presets depending on model
- Options
  - Snoot
  - Lenses
    - MFL, WFL, VWFL







# Studio Color 575 Movement

- 16 bit movement
  - Yoke
  - S and M versions :  $370^{\circ} \times 240^{\circ}$
  - Studio Color 575 version:  $370^{\circ} \times 255^{\circ}$
  - Use crossfade or Mspeed to control movement

# Studio Color 575 Colors



- CMY mixing
  - Use console crossfade to control times
  - 100% is white, 0% is full saturation
- Fixed wheel with 5 colors plus open
  - Works with *color control channel* to change its function
  - Continuous – use either crossfade or Mspeed
    - ❗NOTE: Do not use both Mspeed and crossfade
    -  Mspeed values displayed with \* on Wholehog software (\*indigo)
    -  Path Default on Wholehog II set to Start



# Studio Color 575 Color Control



- Color Control Channel

- ① Effects both color mixing and fixed color wheel

- Continuous – fixed color wheel can stop at any value
    - Indexed – fixed color wheel will only stop on certain values (full and half colors)
    - Spin – rotate the fixed color wheel at a speed determined by setting of *fixed color wheel channel*
    - Cycle – cycle the color mixing wheels through a chase at a speed determined by setting of *fixed color wheel channel*
    - Random - randomize the color mixing wheels through a chase at a speed determined by setting of *fixed color wheel channel*
    - 2X mode – allows the color mixing wheels to spin 2 times for faster color bumps (see next slide for details)



Note for Wholehog software: the *fixed color channel* and the *color control channel* have been combined to one parameter referred to as “colour”

# Studio Color 575 2X Mode



- Quick color bumps!
  - The default mode of the Studio Color color mix wheels allows them to rotate only one time. This means that to go from no color to full saturation, the wheel has to turn through all percentages of the color
  - 2X mode allows the wheel to rotate 2 times. This means that the wheel when set in the middle position can go one way through all the percentages of the color, or the other way to an instant full saturation
  - Using 2x mode, instant bumps and split colors can be achieved

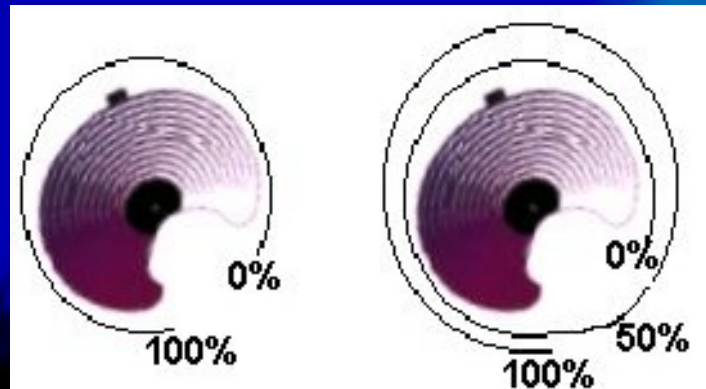


# Studio Color 575 2X Mode



- Setup

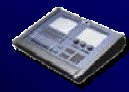
- First set the *color control channel* to 2x mode
- Now set each *color mix channel* to approximately 50%. The fixture should output white
- Turning any color wheel to approximately 45% will be full saturation of that color. Turning the wheel the other direction (towards 100%) will go through all percentages of the color
- Changing in and out of 2x mode may cause the wheels to spin around producing a flash of color or white
- Note: exact percentage values will vary depending upon the console used



Standard Mode

2X Mode

# Studio Color 575 2X Mode






## Using 2x mode on Wholehog II systems

- First set the *colour channel* to “2x 0”
  - Now set each *color mix channel* to approximately 52%. The fixture should output white.
  - Turning any color wheel to approximately 45% will be full saturation of that color. Turning the wheel the other direction (towards 100%) will go through all percentages of the color.
- TIP:
    - Make a palette with the fixtures in 2x mode white and then build all your 2x colors palettes from this palette





# Studio Color 575 Beam Shaping



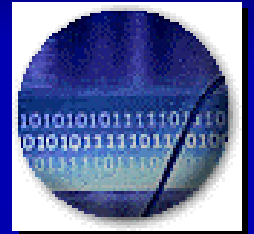
- 2 wheels
  - Frost – has frost lens and beam shaping
    -  Wholehog II software refers to this channel as “frost”
  - Wide angle – has wide angle lens and beam shaping
    -  Wholehog II software refers to this channel as “focus”
- Continuous – use crossfade to control speed
  -  Path Defaults on Wholehog II set to Linear

# Studio Color 575 Strobe

- The *shutter channel* is used to open, close, and strobe the shutter
  -  Wholehog II software refers to this channel as “strobe”
  -  Path Default on Wholehog II set to Start
- Strobing options
  - Normal: 119 speeds
  - Random: 119 speeds



# Studio Color 575 Control Channel



- The shutter must be set to Closed to access the *control channel*. The fixture must receive the control value for 0.5 second before it will send the command.
- Set *shutter channel* to Closed (0%) and adjust *control channel* setting
  - Home (25%)
  - Shutdown (50%)

Note: Shutdown on the M version will stop the fixture from moving, but will not extinguish the lamp



On Wholehog II systems, build a Home palette:

1. In the palette, set the *strobe* to Closed and set the *control channel* at Home
3. Select the fixture and press the palette. Leave the fixture at this setting for at least 3 seconds.
3. Be sure to clear the programmer or the palette otherwise the fixture will Home repeatedly



**CYBERLIGHT®**

**turbo**



# Cyberlight Details

- 3 DMX modes

Address Dipswitch Settings

- Mode 1 – Standard (20 DMX Channels)

[7]

[8]

☐

☒

☒ = On

Suggested

- Mode 2 – Enhanced (20 DMX Channels)

☒

☐

☐ = Off

- Mode 3 - Cyberlight CX (15 DMX Channels)

☒

☒



Wholehog II uses mode 2 (except for CX)

- No onboard presets

- Models

- Cyberlight (CL)



Mode 2 Litho = Cyber with Litho wheel

- Cyberlight CX (CX)



Mode 2 = Cyber with metal Gobo wheel

- Studio Version (SV)

- Cyberlight Turbo (CT)

- Options

- Narrow Angle Lens Kit

- Settings

- Personality dipswitches 1 & 2 on is “non-bink dimming”. This allows for smoother fading in and out of the dimmer




# Cyberlight Movement

- 16 bit Movement
  - Mirror
  - $170^{\circ} \times 110^{\circ}$
  - Use crossfade or Mspeed to control movement
- Standard Lens is  $12^{\circ}$  to  $22^{\circ}$ 
  - $16^{\circ}$  to  $26^{\circ}$  with wide angle from effect wheel
  - Up to  $36^{\circ}$  with wide angle and frost
- CX lens has 3 positions (manually changed)
  - $12^{\circ}$
  - $14^{\circ}$
  - $18^{\circ}$





# Cyberlight Colors



- CMY mixing
  - Use console crossfade to control times
  - 100% is white, 0% is full saturation
- Fixed wheel with 7 colors plus open
  - Not continuous – must use Mspeed to change slowly
    -  Mspeed values displayed with \* on Wholehog software (example: \*indigo)
  - Half Colors
    -  Half color values displayed with + on Wholehog software (example: red+)
  - Wheel Spin spins entire Color wheel
    -  Spin values displayed with >># on Wholehog software (example: >>32)

# Cyberlight Patterns






- Fixed wheel with 7 Lithos plus open
  - Not continuous – must use Mspeed to change slowly
    -  Mspeed values displayed with \* on Wholehog software (example: \*indigo)
  - Litho Scan uses Mspeed to control speed of Scan
    - Scan values displayed with + on Wholehog software (example: stars+)
  - Wheel Spin spins entire litho wheel
    -  Spin values displayed with >># on Wholehog software (example: >>32)



# Cyberlight Rotating Patterns



- Rotating wheel with 4 Lithos plus open
  - Not continuous – must use Mspeed to change slowly
    -  Mspeed values displayed with \* on Wholehog software (example: \*ribbed)
- 2 DMX Channels used
  - Litho Selection
    -  Wholehog software refers to this channel as “gobo 2”
  - Litho Rotation
    -  Wholehog software refers to this channel as “gobo 2<>”

# Cyberlight Rotating Patterns



- Litho Selection Channel

*Choose litho and its mode*

 Wholehog software refers to this channel as “gobo 2”

- Positional Litho

- Allows image to index to any position

 Positional values displayed with name on Wholehog software (example: ribbed)

 Mspeed values displayed with \* on Wholehog software (example: \*ribbed)

- Litho rotation

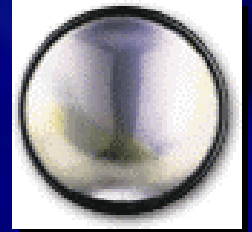
- Allows image to rotate either fwd or rev

 Rotate values displayed with >> on Wholehog software (example: >>ribbed)

 Mspeed values displayed with \* on Wholehog software (example: \*>>ribbed)



# Cyberlight Rotating Patterns



- Litho Rotation Channel



Wholehog software refers to this channel as “gobo 2◊”

- When Positional Litho is selected on the *Litho Selection channel*, this channel controls the orientation of the litho
- When Litho Rotation is selected on the first *Litho Selection channel*, this channel controls the speed of the movement
- Use crossfade to control speed of change





Path Default on Wholehog II is **Start**

- TIP:

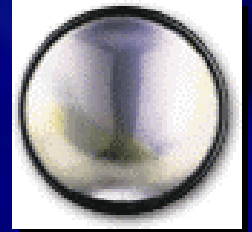
To have a rotating pattern slow to a stop or speed up from a stop without quickly spinning to a specific alignment (an indexed position), set Litho rotation speed to 0 instead of assigning a specific Litho position value



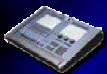

# Cyberlight Effects

- Effects wheel with 7 effects plus open
  -  Wholehog software refers to this channel as “fx/prism”
- Not continuous – must use Mspeed to change slowly
  -  Mspeed values displayed with \* on Wholehog software (\*wide)
- The effects and their associated numbers are:
  1. Prism
  2. CYM Mosaic
  3. Yellow
  4. Open
  5. Magenta
  6. Wide Angle
  7. Diffusion
  8. Cyan






# Cyberlight Beam Parameters



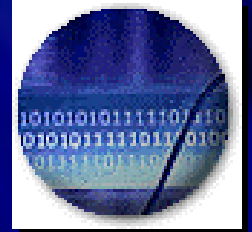
- Frost – not available on CX model
  - Continuous – use crossfade to control speed
  - Frost Strobe – mode 2 only
    - 124 speeds of strobing
-  Path Default on Wholehog II is Linear
- Iris
  - Continuous – use crossfade to control speed
-  Path Default on Wholehog II is Linear
- Zoom
  - Continuous – use crossfade to control speed
-  Path Default on Wholehog II is Linear
- Focus
  - Continuous – use crossfade to control speed
-  Path Default on Wholehog II is Linear

# Cyberlight Strobe

- The *shutter channel* is used to open, close, and strobe the shutter
  - Mode 2 and 3 have 243 strobe speeds
  - Mode 1 has 8 strobe speeds
-  Wholehog II software refers to this channel as “strobe”
-  Path Default on Wholehog II set to Start
- TIP:
  - To create a random strobe effect, set each Cyberlight at a different strobe setting
  -  On Wholehog II systems, first set a mid-range strobe speed on all selected fixtures and then fan the strobe channel (use a random order fixture selection)



# Cyberlight Control Channel



To access the control channel:

1. Assign the *dim channel* at full and the *control channel* at 0
2. Assign the *dim channel* at 0 and leave the *control channel* at 0
3. Within 3 seconds of step 2, Assign the *control channel* to 25% for Home or 50% for Shutdown
4. Leave the *dim* and *control channels* at their settings for 3 seconds



On Wholehog II systems, build two palettes:

1. Take the *dim channel* to 0
2. Set the control channel at Home or Shutdown

When the fixture is at 100% intensity, press the dim palette.

Then after 1 second press the control palette. Leave the fixture at this setting for at least 3 seconds.



***trackspot***<sup>®</sup>



# Trackspot Details

- 7 DMX Channels
- No onboard presets
- Options
  - Lens Kits

① NOTE: The DMX protocol for Trackspot does not allow for homing of the fixture



# Trackspot Movement

- 8 bit Movement
  - Mirror
  - $170^{\circ} \times 110^{\circ}$
  - Use crossfade or Mspeed to control movement






# Trackspot Colors






- Fixed wheel with 11 colors plus open
  - Not continuous – must use Mspeed to change slowly
    -  Mspeed values displayed with \* on Wholehog software (example: \*indigo)
  - Wheel Spin spins entire color wheel
    -  Spin values displayed with >># on Wholehog software (example: >>32)

# Trackspot Patterns

- Fixed wheel with 9 Gobos plus open
  - Not continuous – must use Mspeed to change slowly
    -  Mspeed values displayed with \* on Wholehog software  
(example: \*stars)
  - Gobo Shake uses Mspeed to control speed of shake
    -  Shake values displayed with + on Wholehog software  
(example: +stars)
  - Wheel Spin spins entire gobo wheel
    -  Spin values displayed with >># on Wholehog software  
(example: >>32)



# Trackspot Strobe

- The *shutter channel* is used to open, close, and strobe the shutter
  -  Wholehog II software refers to this channel as “strobe”
  -  Path Default on Wholehog II set to Start
- TIP:
  - To create a random strobe effect, set each Trackspot at a different strobe setting
  -  On Wholehog II systems, set an average strobe speed and then fan the strobe channel (use a random order fixture selection)



**DATAFLASH® AF1000**



# AF1000 Details

- 1, 2, or 3 DMX Channels
  - Personality DIP Switch 3 ON = 1 DMX channel mode
  - Personality DIP Switches 3+4 ON = 2 DMX channel mode
  - Personality DIP Switches 3,4,+5 ON = 3 DMX channel mode
- **Note:** The AF1000 LCD and Mini controllers use 2 channel mode
- Modes
  - Standard= Personality Dip Switch 6+7 OFF
  - Architectural=Personality Dip Switch 6 ON
  - Special Effects= Personality Dip Switch 7ON
- Lamps
  - SO= Standard Dataflash Lamp
  - HO=High Output Lamp needed for Architectural and Special Effects mode settings
- Options
  - Colored domes
  - Axial reflector
  - Weatherized fixture

# AF1000 Duty Cycle

- Duty cycle is how the AF1000 protects the lamp from overheating. With each flash of the lamp, the internal circuitry of each fixture calculates how much energy is released. When a specific amount of energy is released within a certain time, the fixture goes into a cool down period.
- Higher intensities, rates, and durations can mean shorter duty cycles. Lower intensities, rates and durations mean longer duty cycles
- Cool down lasts 2 minutes in standard mode and 5 minutes in Architectural and Special Effects modes
- Avoid overheating the lamp by decreasing the intensity of the strobe as the Rate and/or duration of each strobe is increased
- There is an inverse relationship between the Intensity and the Rate / Duration so if one is increased, the other parameters must be reduced in order to lengthen the duty cycle of the strobe



# AF1000 Intensity

- The *intensity channel* controls the brightness of the fixture
- The higher the intensity, the less time before the fixture reaches thermal temperature



# AF1000 Rate

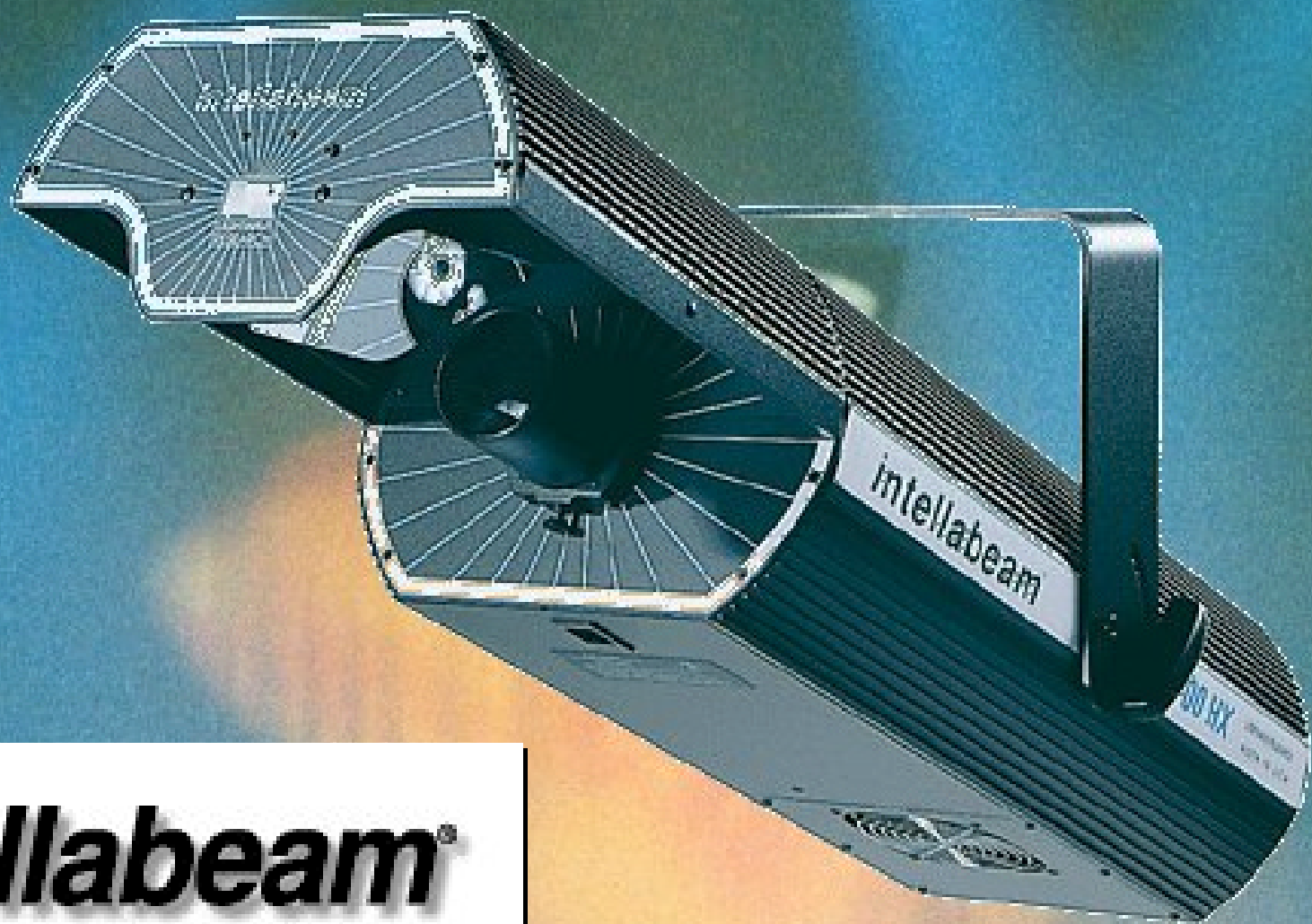
- The *rate channel* controls the rate of the strobe
- The faster the rate, the less time before the fixture reaches thermal temperature



# AF1000 Duration

- The *duration channel* controls the duration of the strobe
- The longer the duration, the less time before the fixture reaches thermal temperature





***intellabeam®***



# Intellabeam Details

- 8 DMX modes:

Personality Dip switches

- 7 OFF is oscillating colors, 7 ON is split colors
- 3 on DMX address 1-256 / 4 on DMX address 257-501

Dipswitch settings

	[5]	[6]	[8]
– 7 channel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– 8 channel (with Mspeed)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
– 7 channel (hi-res)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
– 8 channel (hi-res w/ Mspeed)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
– 11 chan. extended	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
– 12 chan. extended	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
– 12 chan. extended (w/ home)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
– 13 chan. extended (w/ home)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

☒ = ON  
☐ = OFF





Wholehog II systems use 13 channel extended mode

# Intellabeam Movement

- 16 bit Movement
  - Mirror
  - $170^{\circ} \times 110^{\circ}$
  - Use crossfade or Mspeed to control movement




# Intellabeam Colors



- Fixed wheel with 11 colors plus open
  - Not continuous – must use Mspeed to change slowly
    -  Mspeed values displayed with \* on Wholehog software (example: \*indigo)
  - Wheel Spin spins entire color wheel
    -  Spin values displayed with >># on Wholehog software (example: >>32)




# Intellabeam Patterns

- Fixed wheel with 11 Gobos plus open
  - Not continuous – must use Mspeed to change slowly
    -  Mspeed values displayed with \* on Wholehog software  
(example: \*stars)
  - Gobo Shake uses Mspeed to control speed of shake
    -  Shake values displayed with + on Wholehog software  
(example: +stars)
  - Wheel Spin spins entire gobo wheel
    -  Spin values displayed with >># on Wholehog software  
(example: >>32)

# Intellabeam Iris



- Iris
    - Continuous – use crossfade to control speed
-  Path Default on Wholehog II set to Linear

# Intellabeam Strobe


- The *shutter channel* is used to open, close, and strobe the shutter



Wholehog II software refers to this channel as “strobe”

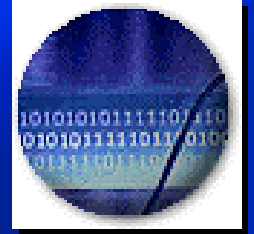


Path Default on Wholehog II set to Start

- TIP:
  - To create a random strobe effect, set each Intellabeam at a different strobe setting
-  On Wholehog II systems, set an average strobe speed and then fan the strobe channel (use a random order fixture selection)



# Intellabeam Control Channel



To access the control channel:

1. Assign the *dim channel* at full and the *control channel* at 0
2. Assign the *dim channel* at 0 and leave the *control channel* at 0
3. Within 3 seconds of step 2, Assign the *control channel* to 25% for Home or 50% for Shutdown
4. Leave the *dim* and *control channels* at their settings for 3 seconds



On Wholehog II systems, build two palettes:

1. Take the *dim channel* to 0
2. Set the control channel at Home or Shutdown

When the fixture is at 100% intensity, press the dim palette.

Then after 1 second press the control palette. Leave the fixture at this setting for at least 3 seconds.

# DMX Protocols

The following section includes the DMX protocols for all the fixtures in this guide.



# x.Spot DMX Protocol

Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
<b>BASIC FIXTURE FUNCTIONS</b>					
1	Pan Coarse	Coarse-adjusts pan to approximately 1-degree of desired position	0-255	0-100	00-FF
2	Pan Fine	Fine-adjusts pan position in increments < 1 degree	0-255	0-100	00-FF
3	Tilt Coarse	Coarse-adjusts tilt to approximately 1-degree of desired position	0-255	0-100	00-FF
4	Tilt Fine	Fine-adjusts tilt position in increments < 1 degree	0-255	0-100	00-FF
5	Lamp Control	Normal Shutter Functions	0-31	0-12	00-1F
		Lamp Assisted Strobes ( <i>Only the periodic and random strobe functions are lamp assisted. Ramping functions are not lamp assisted.</i> )	32-63	13-25	20-3F
		Lamp Functions ( <i>Modifies the Shutter channel.</i> )	64-95	35-37	40-5F
		Lamp—Mechanical Dimming (0%–100%)	96-127	38-50	60-7F
		Lamp—Electronic Dimming Only ( <i>Lamp output varies from a minimum–700W</i> )	128-159	50-62	80-9F
		TBD	160-191	63-75	A0-BF
		TBD	192-223	75-88	C0-DF
		Normal Shutter Functions	224-255	88-100	E0-FF
6	Shutter	<b>Normal Shutter Functions (Lamp Control channel = 0-31 range)</b>			
		Close	0-23	0-9	00-17
		Periodic Strobe (variable)	24-49	9-19	18-31
		Random/Random Strobe (variable)	50-75	20-29	32-4B
		Random/Synchronous Strobe (variable)	76-101	30-40	4C-65
		Ramp Open/Snap Shut (variable)	102-127	40-50	66-7F
		Snap Open/Ramp Shut (variable)	128-153	50-60	80-99
		Ramp Open/Ramp Shut (variable)	154-179	60-70	9A-B3
		Random Ramp/Snap (variable)	180-205	71-80	B4-CD
		Random Snap/Ramp (variable)	206-231	81-91	CE-E7
		Open	232-255	91-100	E8-FF
		<b>Lamp Assisted Strobes (Lamp Control channel set in the 32-63 range)</b>			
		Close	0-23	0-9	00-17
		Periodic Strobe (variable, Lamp assisted)	24-49	9-19	18-31
		Random/Rand Strobe (variable, Lamp assisted)	50-75	20-29	32-4B
		Random/Sync (variable, Lamp assisted)	76-101	30-40	4C-65
		Ramp Open/Snap Shut (variable)	102-127	40-50	66-7F
		Snap Open/Ramp Shut (variable)	128-153	50-60	80-9A
		Ramp Open/Ramp Shut (variable)	154-179	60-70	9A-B3



Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
6	Shutter (continued)	Random Ramp/Snap (variable)	180-205	71-80	B4-CD
		Random Snap/Ramp (variable)	206-231	81-91	CE-E7
		Open	232-255	91-100	E8-FF
		<b>Lamp Functions (With Lamp Control channel set from 64-95 dec.)</b>			
		<ul style="list-style-type: none"> <li>• The Boost effect boosts the Lamp above the 700 Watt level for the specified period of time. The lamp is also boosted during the Lightning effects.</li> <li>• Before another Boost or Lightning effect can occur, move the Shutter channel to either closed or open, or move the Lamp Control channel outside the Lamp Function range.</li> <li>• Boost effects to black boost the lamp for the specified time and then close the shutter.</li> <li>• Boost effects to white boost the lamp for the specified time, then leave the shutter open with the lamp dimmed.</li> <li>• When a Lightning effect is selected, the Dim channel scales the overall brightness of the lightning stroke.</li> <li>• Dim at 255 yields maximum brightness.</li> </ul>			
		Close	0-23	0-9	00-17
		Periodic lamp strobes	24-49	9-19	18-31
		Random random lamp strobes	50-75	20-29	32-4B
		Synchronous random lamp strobes	76-101	30-40	4C-65
		Boost lamp 1.0 second, black	102-105	40-41	66-69
		Boost lamp 0.75 second, black	106-109	42-43	6A-6D
		Boost lamp 0.66 second, black	110-113	43-44	6E-71
		Boost lamp 0.5 second, black	114-117	45-46	72-75
		Boost lamp 0.33 second, black	118-121	46-47	76-79
		Boost lamp 0.25 second, black	122-127	48-50	7A-7F
		Boost lamp 1.0 second, white	128-131	50-51	80-83
		Boost lamp 0.75 second, white	132-135	52-53	84-87
		Boost lamp 0.66 second, white	136-139	53-55	88-8B
		Boost lamp 0.50 second, white	140-143	55-56	8C-8F
		Boost lamp 0.33 second, white	144-147	56-58	90-93
		Boost lamp 0.25 second, white	148-153	58-60	94-99
		Lightning strike 1	154-157	60-62	9A-9D
		Lightning strike 2	158-161	62-63	9E-A1
		Lightning strike 3	162-165	64-65	A2-A5
		Lightning strike 4	166-169	65-66	A6-A9
		Lightning strike 5	170-173	67-68	AA-AD
		Lightning strike 6	174-179	68-70	AE-B3
		TBD. Default Black.	180-231	71-91	B4-E7
		Open	232-255	91-100	E8-FF

Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
6	Shutter (continued)	Lamp—Electronic Dimming Only (Lamp Control channel 128–159 dec)			
		• Dimming is accomplished electronically, lowering the lamp power			
		• Dimming will not go to black.			
		Close	0-23	0-9	00-17
		Periodic Strobe (variable)	24-49	9-19	18-31
		Random/Rand Strobe (variable)	50-75	20-29	32-4B
		Random/Sync (variable)	76-101	30-40	4C-65
		Ramp Open/Snap Shut (variable)	102-127	40-50	66-7F
		Snap Open/Ramp Shut (variable)	128-153	50-60	80-99
		Ramp Open/Ramp Shut (variable)	154-179	60-70	9A-B3
		Random Ramp/Snap (variable)	180-205	71-80	B4-CD
		Random Snap/Ramp (variable)	206-231	81-91	CE-E7
		Open	232-255	91-100	E8-FF
7	Dim	Closed	0	0	00
		Open	255	100	FF
8	Frost	Open (No Frost)	0	0	00
		Variable Frost (open to closed)	1-127	1-49	01-7F
		Full Frost	128-135	50-53	80-87
		Periodic Frost Strobe (slow to fast)	136-151	53-59	88-97
		Random Frost Strobe (slow to fast)	152-167	60-66	98-A7
		Ramp Open/Snap Shut	168-183	66-72	A8-B7
		Snap Open/Ramp Shut	184-199	72-78	B8-C7
		Ramp Open/Ramp Shut	200-215	78-84	C8-D7
		Random Ramp/Snap	216-231	85-91	D8-E7
		Random Snap/Ramp	232-247	91-97	E8-F7
		Open (No Frost)	248-255	97-100	F8-FF
9	Focus Control	Auto Focus	0-31	0-12	00-1F
		Manual Focus	32-63	13-24	20-3F
		TBD	64-95	25-37	40-5F
		TBD	96-127	38-49	60-7F
		TBD	128-159	50-62	80-9F
		TBD	160-191	63-74	A0-BF
		TBD	192-223	75-87	C0-DF
		TBD	224-255	88-100	E0-FF
10	Focus	Auto or Manual Focus In	0	0	00
		Auto or Manual Focus Out	255	100	FF
11	Zoom	Zoom in	0	0	00
		Zoom out	255	100	FF
12	Mspeed	(see “Mspeed Conversion Table in Appendix B)			

Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
13	Macro (MacroSpeed controlled via Mspeed)	Macro Off	0-5	0-2	00-05
		TBD	6-62	2-24	06-3E
		Macro Off	63-65	25-26	3F-41
		TBD	66-122	26-48	42-7A
		Macro Off	123-125	48-49	7B-7D
		TBD	126-160	49-63	7E-A0
		Macro Off	161-163	63-64	A1-A3
		TBD	164-198	64-78	A4-C6
		TBD	199-255	78-100	C7-FF
14	Control (Set Shutter Channel to "0" to access Control channel settings except for Pan/Tilt)	Safe	0-9	0-4	00-09
		Pan and Tilt Mspeed Off	10-19	4-8	0A-13
		Display Off	20-28	8-11	14-1C
		Display Dim	30-38	12-15	1E-26
		Display Bright	40-48	16-19	28-30
		Home All	60-68	24-27	3C-44
		Lamp On	80-88	31-35	50-58
		Lamp Off	90-98	35-38	5A-62
		Shutdown	120-130	47-51	78-82
		TBD	131-149	51-58	83-95
		Home Pan/Tilt	160-168	63-66	A0-A8
		Home Color System	170-178	67-70	AA-B2
		Home Gobi System	180-188	70-74	B4-BC
		Home Strobe/Dim	190-198	75-78	78-C6
		Home Focus/Zoom/Frost	200-208	78-82	C8-D0
		Home Iris	210-218	82-86	D2-DA



Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
<b>SLOT 1: SIX-WHEEL COLOR MIXING MODULE</b>					
15	Static Color Function (Scan and Blink Modes defined using Indexed wheel operation.)	Full Speed Control			
		Indexed	0 - 15	0-6	0-0F
		Forward Spin	16-31	6-12	10-1F
		Reverse Spin	32-47	13-18	20-2F
		Continuous	48-63	19-25	30-3F
		Slow Scan	64-79	25-31	40-4F
		Fast Scan	80-95	31-37	50-5F
		Random	96-111	38-44	60-6F
		Blink-Indexed	112-127	44-50	70-7F
		MSpeed Control			
		Indexed	128-143	50-56	80-8F
		Forward Spin	144-159	57-62	90-9F
		Reverse Spin	160-175	63-69	A0-AF
		Continuous	176-191	69-75	B0-BF
		Slow Scan	192-207	75-81	C0-CF
		Fast Scan	208-223	82-88	D0-DF
		Random	224-239	88-94	E0-EF
		Blink-Indexed	240-255	94-100	F0-FF
16	Static Color Position	Indexed Mode			
		Color Position 1 Open (White)	0-23	0-9	0-17
		Position 1 2	24-42	2-17	18-2A
		Position 2	43-61	17-24	2B-3D
		Position 2 3	62-80	24-31	3E-50
		Position 3	81-99	32-38	51-62
		Position 3 4	100-118	39-46	63-76
		Position 4	119-137	47-54	77-89
		Position 4 5	138-156	54-61	8A-9C
		Position 5	157-175	62-69	9D-AF
		Position 5 6	176-194	69-76	B0-C2
		Position 6	195-213	77-84	C3-D5
		Position 6 1	214-232	84-91	D6-E8
		Position 1 Open (White)	233-255	91-100	E9-FF
17	Mix Color Function	Full Speed Control			
		Continuous	0-15	0-6	0-0F
		2x Continuous	16-31	6-12	10-1F
		TBD	32-47	13-18	20-2F
		Spin (Puts all the wheels in spin mode. Wheel Spin speed, direction, or fixed position can be set individually on CYM channels.)	48-63	19-25	30-3F
		Cycle (Rate set by Cyan channel)	64-79	25-31	40-4F
		TBD	80-95	31-37	50-5F

Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
17	Mix Color Function continued	Random (Rate set by Cyan channel.)	96-111	38-44	60-6F
		Blink (Defined using Continuous wheel operation)	112-127	44-50	70-7F
		MSpeed Control			
		Continuous	128-143	50-56	80-8F
		2x Continuous	144-159	57-62	90-9F
		TBD	160-175	63-69	A0-AF
		Spin (Puts all the wheels in spin mode. Wheel Spin speed, direction, or fixed position can be set individually on CYM channels.)	176-191	69-75	B0-BF
		Cycle (Rate set by Cyan channel)	192-207	75-81	C0-CF
		TBD	208-223	82-88	D0-DF
		Random (Rate set by Cyan channel.)	224-239	88-94	E0-EF
		Blink (Defined using Continuous wheel operation)	240-255	94-100	F0-FF
18	Cyan	Continuous Mode			
		Full Cyan	0	0	00
		Open	255	100	FF
		Spin Mode			
		Continuous Positioning	0-127	0-50	00-7F
		Spin Reverse fastest	128-157	50-62	80-9D
		Spin Reverse slowest	158-187	62-73	9E-BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward slowest	196-225	77-88	C4-E1
		Spin Forward fastest	226-255	89-100	E2-FF
		Cycle and Random Modes			
		Slow Rate	0	0	00
		Fast Rate	255	100	FF
		2X Continuous Mode			
		Full Cyan	0	0	0
		Open	127	50	7F
		Full Cyan	128	50	80
		Open	255	100	FF
19	Magenta	Continuous Mode			
		Full Magenta	0	0	00
		Open	255	100	FF
		Spin Mode			
		Continuous Positioning	0-127	0-50	00-7F
		Spin Reverse fastest	128-157	50-62	80-9D
		Spin Reverse slowest	158-187	62-73	9E-BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward slowest	196-225	77-88	C4-E1
		Spin Forward fastest	226-255	89-100	E2-FF

Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
19	Magenta continued	Cycle and Random Modes			
		Slow Rate	0	0	00
		Fast Rate	255	100	FF
		2X Continuous Mode			
		Full Magenta	0	0	0
		Open	127	50	7F
		Full Magenta	128	50	80
		Open	255	100	FF
20	Yellow	Continuous Mode			
		Full Yellow	0	0	00
		Open	255	100	FF
		Spin Mode			
		Continuous Positioning	0-127	0-50	00-7F
		Spin Reverse fastest	128-157	50-62	80-9D
		Spin Reverse slowest	158-187	62-73	9E-BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward slowest	196-225	77-88	C4-E1
		Spin Forward fastest	226-255	89-100	E2-FF
		Cycle and Random Modes			
		Slow Rate	0	0	00
		Fast Rate	255	100	FF
		2X Continuous Mode			
		Full Yellow	0	0	0
		Open	127	50	7F
		Full Yellow	128	50	80
		Open	255	100	FF
21	Color Temperature Orange	Always in Continuous mode			
		Open	0	0	0
		Full CTO	170	67	AA
		Diffusion	213	84	D5
		Open	255	100	FF
22	Color Temperature Blue	Always in Continuous Mode			
		Full Diffusion	0	0	0
		Open	43	17	2B
		Full CTB	213	84	D5
		Diffusion	255	100	FF



Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
<b>SLOT 2: DUAL ROTATING GOBOS MODULE</b>					
23	Gobo1 Function <i>Index Gobo position defines Blink and Scan modes.</i>	Full Speed Control			
		Indexed	0 - 15	0-6	0-0F
		Forward Wheel Spin	16-31	6-12	10-1F
		Reverse Wheel Spin	32-47	13-18	20-2F
		Scanning	48-63	19-25	30-3F
		Random	64-79	25-31	40-4F
		Blink Wheel (opens and closes the shutter on wheel position changes)	80-95	31-37	50-5F
		TBC	96-111	38-44	60-6F
		Continuous	112-127	44-50	70-7F
23	Gobo1 Function (continued)	MSpeed Control			
		Indexed	128-143	50-56	80-8F
		Forward Wheel Spin	144-159	57-62	90-9F
		Reverse Wheel Spin	160-175	63-69	A0-AF
		Scanning	176-191	69-75	B0-BF
		Random	192-207	75-81	C0-CF
		Blink Wheel (opens and closes the shutter on wheel position changes)	208-223	82-88	D0-DF
		TBC	224-239	88-94	E0-EF
		Continuous	240-255	94-100	F0-FF
24	Gobo 1 Position	Indexed Mode			
		Position 1 (Open)	0-15	0-6	0-0F
		Position 2	16-47	6-18	10-2F
		Position 3	48-79	19-31	30-4F
		Position 4	80-111	31-44	50-6F
		Position 5	112-143	44-56	70-8F
		Position 6	144-175	57-69	90-AF
		Position 7	176-207	69-81	B0-CF
		Position 8	208-239	82-94	D0-EF
		Position 1 (Open)	240-255	94-100	F0-FF
		Forward Wheel Spin Mode			
		Spin Stop	0-3	0-1	0-3
		Spin Forward Slowest	4	2	4
		Spin Forward Fastest	255	100	FF
		Reverse Wheel Spin			
		Spin Stop	0-3	0-1	0-3
		Spin Reverse Slowest	4	2	4
		Spin Reverse Fastest	255	100	FF

Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
24	Gobo 1 Position cont.	Scan Mode			
		Position 1 (Open)	0-15	0-6	0-0F
		Position 2	16-47	6-18	10-2F
		Position 3	48-79	19-31	30-4F
		Position 4	80-111	31-44	50-6F
		Position 5	112-143	44-56	70-8F
		Position 6	144-175	57-69	90-AF
		Position 7	176-207	69-81	B0-CF
		Position 8	208-239	82-94	D0-EF
		Position 1 (Open)	240-255	94-100	F0-FF
		Random Mode			
		Random Stop	0-3	0-1	0-3
		Random Slowest	4	2	4
		Random Fastest	255	100	FF
25	Gobo 1 Rotate Function	Full Speed Control			
		Indexed	0-15	0-6	0-0F
		Forward Rotate	16-31	6-12	10-1F
		Reverse Rotate	32-47	13-18	20-2F
		Scanning	48-63	19-25	30-3F
		Blink Aperture (opens and closes the shutter on aperture rotate changes)	64-79	25-31	40-4F
		TBD	80-95	31-37	50-5F
		TBD	96-111	38-44	60-6F
		TBD	112-127	44-50	70-7F
		MSpeed Control			
		Indexed	128-143	50-56	80-8F
		Forward Rotate	144-159	57-62	90-9F
		Reverse Rotate	160-175	63-69	A0-AF
		Scanning	176-191	69-75	B0-BF
		Blink Aperture (opens and closes the shutter on aperture rotate changes)	192-207	75-81	C0-CF
		TBD	208-223	82-88	D0-DF
		TBD	224-239	88-94	E0-EF
		TBD	240-255	94-100	F0-FF

Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
26	Gobo 1 Rotate Coarse	Indexed Mode			
		Position	0-255	0-100	0-FF
		Continuously Variable Forward Rotate Mode			
		Rotate Stop	0-3	0-1	0-3
		Rotate Forward Slowest	4	2	4
		Rotate Forward Fastest	255	100	FF
		Continuously Variable Reverse Rotate Mode			
		Rotate Stop	0-3	0-1	0-3
		Rotate Reverse Slowest	4	2	4
		Rotate Reverse Fastest	255	100	FF
		Scan Mode			
		Slowest Scanning	0	0	0
		Fastest Scanning	255	100	FF
27	Gobo 1 Rotate Fine	Indexed Mode			
		Low Order Byte	0-255	0-100	0-FF
28	Effects Function	Full Speed Control			
		Indexed	0 - 15	0-6	0-0F
		Forward Wheel Spin	16-31	6-12	10-1F
		Reverse Wheel Spin	32-47	13-18	20-2F
		Scanning	48-63	19-25	30-3F
		Random	64-79	25-31	40-4F
		Blink Wheel (opens and closes the shutter on wheel position changes)	80-95	31-37	50-5F
		TBC	96-111	38-44	60-6F
		Continuous	112-127	44-50	70-7F
		MSpeed Control			
		Indexed	128-143	50-56	80-8F
		Forward Wheel Spin	144-159	57-62	90-9F
		Reverse Wheel Spin	160-175	63-69	A0-AF
		Scanning	176-191	69-75	B0-BF
		Random	192-207	75-81	C0-CF
		Blink Wheel (opens and closes the shutter on wheel position changes)	208-223	82-88	D0-DF
		TBC	224-239	88-94	E0-EF
		Continuous	240-255	94-100	F0-FF
	Effects Position	Indexed Mode			
		Position 1 (Open)	0-15	0-6	0-0F
		Position 2	16-47	6-18	10-2F
		Position 3	48-79	19-31	30-4F
		Position 4	80-111	31-44	50-6F
		Position 5	112-143	44-56	70-8F



Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
29	Effects Position	Position 6	144-175	57-69	90-AF
		Position 7	176-207	69-81	B0-CF
		Position 8	208-239	82-94	D0-EF
		Position 1 (Open)	240-255	94-100	F0-FF
		Forward Wheel Spin Mode			
		Spin Stop	0-3	0-1	0-3
		Spin Forward Slowest	4	2	4
		Spin Forward Fastest	255	100	FF
		Reverse Wheel Spin			
		Spin Stop	0-3	0-1	0-3
		Spin Reverse Slowest	4	2	4
		Spin Reverse Fastest	255	100	FF
		Scan Mode			
		Position 1 (Open)	0-15	0-6	0-0F
		Position 2	16-47	6-18	10-2F
		Position 3	48-79	19-31	30-4F
		Position 4	80-111	31-44	50-6F
		Position 5	112-143	44-56	70-8F
		Position 6	144-175	57-69	90-AF
		Position 7	176-207	69-81	B0-CF
		Position 8	208-239	82-94	D0-EF
		Position 1 (Open)	240-255	94-100	F0-FF
		Random Mode			
		Random Stop	0-3	0-1	0-3
		Random Slowest	4	2	4
		Random Fastest	255	100	FF
30	Effects Rotate Function	Full Speed Control			
		Indexed	0-15	0-6	0-0F
		Forward Rotate	16-31	6-12	10-1F
		Reverse Rotate	32-47	13-18	20-2F
		Scanning	48-63	19-25	30-3F
		Blink Aperture (opens and closes the shutter on aperture rotate changes)	64-79	25-31	40-4F
		TBD	80-95	31-37	50-5F
		TBD	96-111	38-44	60-6F
		TBD	112-127	44-50	70-7F
		MSpeed Control			
		Indexed	128-143	50-56	80-8F
		Forward Rotate	144-159	57-62	90-9F
		Reverse Rotate	160-175	63-69	A0-AF
		Scanning	176-191	69-75	B0-BF

Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
30	Effects Rotate Function continued	Blink Aperture (opens and closes the shutter on aperture rotate changes)	192-207	75-81	C0-CF
		TBD	208-223	82-88	D0-DF
		TBD	224-239	88-94	E0-EF
		TBD	240-255	94-100	F0-FF
31	Effects Rotate Coarse	Indexed Mode			
		Position	0-255	0-100	0-FF
		Continuously Variable Forward Rotate Mode			
		Rotate Stop	0-3	0-1	0-3
		Rotate Forward Slowest	4	2	4
		Rotate Forward Fastest	255	100	FF
		Continuously Variable Reverse Rotate Mode			
		Rotate Stop	0-3	0-1	0-3
		Rotate Reverse Slowest	4	2	4
		Rotate Reverse Fastest	255	100	FF
		Scan Mode			
		Slowest Scanning	0	0	0
		Fastest Scanning	255	100	FF
32	Effects Rotate Fine	Indexed Mode			
		Low Order Byte	0-255	0-100	0-FF

Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
<b>SLOT 3: ROTATING GOBO 2 AND IRIS MODULE</b>					
33	Gobo 2 Function	<b>Full Speed Control</b>			
		Indexed	0 - 15	0-6	0-0F
		Forward Wheel Spin	16-31	6-12	10-1F
		Reverse Wheel Spin	32-47	13-18	20-2F
		Scanning	48-63	19-25	30-3F
		Random	64-79	25-31	40-4F
		Blink Wheel (opens and closes the shutter on wheel position changes)	80-95	31-37	50-5F
		TBC	96-111	38-44	60-6F
		Continuous	112-127	44-50	70-7F
		<b>MSpeed Control</b>			
		Indexed	128-143	50-56	80-8F
		Forward Wheel Spin	144-159	57-62	90-9F
		Reverse Wheel Spin	160-175	63-69	A0-AF
		Scanning	176-191	69-75	B0-BF
		Random	192-207	75-81	C0-CF
		Blink Wheel (opens and closes the shutter on wheel position changes)	208-223	82-88	D0-DF
		TBC	224-239	88-94	E0-EF
		Continuous	240-255	94-100	F0-FF
34	Gobo 2 Position	<b>Indexed Mode</b>			
		Position 1 (Open)	0-15	0-6	0-0F
		Position 2	16-47	6-18	10-2F
		Position 3	48-79	19-31	30-4F
		Position 4	80-111	31-44	50-6F
		Position 5	112-143	44-56	70-8F
		Position 6	144-175	57-69	90-AF
		Position 7	176-207	69-81	B0-CF
		Position 8	208-239	82-94	D0-EF
		Position 1 (Open)	240-255	94-100	F0-FF
		<b>Forward Wheel Spin Mode</b>			
		Spin Stop	0-3	0-1	0-3
		Spin Forward Slowest	4	2	4
		Spin Forward Fastest	255	100	FF
		<b>Reverse Wheel Spin</b>			
		Spin Stop	0-3	0-1	0-3
		Spin Reverse Slowest	4	2	4
		Spin Reverse Fastest	255	100	FF
		<b>Scan Mode</b>			
		Position 1 (Open)	0-15	0-6	0-0F



Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
34	Gobo 2 Position continued	Position 2	16-47	6-18	10-2F
		Position 3	48-79	19-31	30-4F
		Position 4	80-111	31-44	50-6F
		Position 5	112-143	44-56	70-8F
		Position 6	144-175	57-69	90-AF
		Position 7	176-207	69-81	B0-CF
		Position 8	208-239	82-94	D0-EF
		Position 1 (Open)	240-255	94-100	F0-FF
		Random Mode			
		Random Stop	0-3	0-1	0-3
		Random Slowest	4	2	4
		Random Fastest	255	100	FF
35	Gobo 2 Rotate Function	Full Speed Control			
		Indexed	0-15	0-6	0-0F
		Forward Rotate	16-31	6-12	10-1F
		Reverse Rotate	32-47	13-18	20-2F
		Scanning	48-63	19-25	30-3F
		Blink Aperture (opens and closes the shutter on aperture rotate changes)	64-79	25-31	40-4F
		TBD	80-95	31-37	50-5F
		TBD	96-111	38-44	60-6F
		TBD	112-127	44-50	70-7F
		MSpeed Control			
		Indexed	128-143	50-56	80-8F
		Forward Rotate	144-159	57-62	90-9F
		Reverse Rotate	160-175	63-69	A0-AF
		Scanning	176-191	69-75	B0-BF
		Blink Aperture (opens and closes the shutter on aperture rotate changes)	192-207	75-81	C0-CF
		TBD	208-223	82-88	D0-DF
		TBD	224-239	88-94	E0-EF
		TBD	240-255	94-100	F0-FF

Chan.	Parameter	Description	Value (dec.)	Value (%)	Value (hex)
36	Gobo 2 Rotate Coarse	Indexed Mode			
		Position	0-255	0-100	0-FF
		Continuously Variable Forward Rotate Mode			
		Rotate Stop	0-3	0-1	0-3
		Rotate Forward Slowest	4	2	4
		Rotate Forward Fastest	255	100	FF
		Continuously Variable Reverse Rotate Mode			
		Rotate Stop	0-3	0-1	0-3
		Rotate Reverse Slowest	4	2	4
		Rotate Reverse Fastest	255	100	FF
		Scan Mode			
		Slowest Scanning	0	0	0
		Fastest Scanning	255	100	FF
37	Gobo 2 Rotate Fine	Indexed Mode			
		Low Order Byte	0-255	0-100	0-FF
38	Iris	Closed	0	0	0
		Variable Iris	1-127	1-50	01-7F
		Open	128-135	50-53	80-87
		Periodic Strobe (Variable)	136-151	53-59	88-97
		Random Strobe (Variable)	152-167	60-66	98-A7
		Ramp Open/Snap Shut (Variable)	168-183	66-72	A8-B7
		Snap Open/Ramp Shut (Variable)	184-199	72-78	B8-C7
		Ramp Open/Ramp Shut (Variable)	200-215	78-84	C8-D7
		Random Ramp/Snap (Variable)	216-231	85-91	D8-E7
		Random Snap/Ramp (Variable)	232-247	91-97	E8-F7
		Open	248-255	97-100	F8-FF

## EC-2 DMX Protocol

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
1	Dim	Continuous Positioning (closed to open)	0-255	0-100	00-FF
2	Shutter (Note: Snap instantly opens or closes at full speed. Ramp opens or closes at specified speeds.)	Close	0-31	0-12	00-1F
		Periodic Strobe (Variable)	32-63	13-25	20-3F
		Random/Rand Strobe (Variable)	64-95	25-37	40-5F
		Random/Sync (Variable)	96-127	38-50	60-7F
		Ramp Open/Ramp Shut (Variable)	128-159	50-62	80-9F
		Random Ramp/Ramp (Variable)	160-191	63-75	A0-BF
		TBD (Reserved for future use)	192-223	75-88	C0-DF
		Open	224-255	88-100	E0-FF
3	Color Function	<b>Full Speeds</b>			
		Continuous	0-15	0-6	00-0F
		TBD	16-31	6-12	10-1F
		TBD	32-47	13-18	20-2F
		Spin (Puts all the color wheels in spin mode. Wheel spin speed, direction, or fixed position can be set individually on Red, Green, and Blue channels)	48-63	19-25	30-3F
		Cycle (3 wheels use color mix portion to cycle colors. Rate set by Red channel)	64-79	25-31	40-4F
		Color Scan (Puts all the color wheels in scan mode. Scans only the continuous color portion of the wheel - not the open "white" portion. Fixed position or scanning speed can be set individually on Red, Green, and Blue channels)	80-95	31-37	50-5F
		Random (3 wheels perform pseudo-random color chase. Rate set by Red channel)	96-111	38-44	60-6F
		Blink (Closes shutter between color wheel changes. Blink Mode is defined using continuous wheel operation)	112-127	44-50	70-7F
		<b>MSpeed Controlled (same functional descriptions as Full Speeds)</b>			
		Continuous	128-143	50-56	80-8F
		TBD	144-159	57-62	90-9F
		TBD	160-175	63-69	A0-AF
		Spin	176-191	69-75	B0-BF
		Cycle	192-207	75-81	C0-CF
		Color Scan	208-223	82-88	D0-DF
		Random	224-239	88-94	E0-EF
		Blink	240-255	94-100	F0-FF



EC-2 DMX Protocol

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
4	Red (-Cyan)	<b>Continuous Mode</b>			
		Full Red	0	0	00
		Open	255	100	FF
		<b>Spin Mode</b>			
		Continuous Positioning	0-127	0-50	00-7F
		Spin Reverse fastest (variable)	128-157	50-62	80-9D
		Spin Reverse slowest (variable)	158-187	62-73	9E-BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward slowest (variable)	196-225	77-88	C4-E1
		Spin Forward fastest (variable)	226-255	89-100	E2-FF
		<b>Color Scan Mode</b>			
		Continuous Positioning	0-127	0-50	00-7F
		Scanning (slow to fast)	128-255	50-100	80-FF
		<b>Cycle &amp; Random Modes</b>			
		Slow Rate	0	0	00
		Fast Rate	255	100	FF
5	Green (-Magenta)	<b>Continuous Mode</b>			
		Full Green	0	0	00
		Open	255	100	FF
		<b>Spin Mode</b>			
		Continuous Positioning	0-127	0-50	00-7F
		Spin Reverse fastest (variable)	128-157	50-62	80-9D
		Spin Reverse slowest (variable)	158-187	62-73	9E-BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward slowest (variable)	196-225	77-88	C4-E1
		Spin Forward fastest (variable)	226-255	89-100	E2-FF
		<b>Color Scan Mode</b>			
		Continuous Positioning	0-127	0-50	00-7F
		Scanning (slow to fast)	128-255	50-100	80-FF
6	Blue (-Yellow)	<b>Continuous Mode</b>			
		Full Blue	0	0	00
		Open	255	100	FF
		<b>Spin Mode</b>			
		Continuous Positioning	0-127	0-50	00-7F
		Spin Reverse fastest (variable)	128-157	50-62	80-9D
		Spin Reverse slowest (variable)	158-187	62-73	9E-BB
		Spin Stop	188-195	74-77	BC-C3

### EC-2 DMX Protocol

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
6 cont.	Blue (-Yellow) cont.	Spin Forward slowest (variable)	196-225	77-88	C4-E1
		Spin Forward fastest (variable)	226-255	89-100	E2-FF
		<b>Color Scan Mode</b>			
		Continuous Positioning	0-127	0-50	00-7F
		Scanning (slow to fast)	128-255	50-100	80-FF
7	MSpeed	(see Table A-2 on page A-2)			
8	Control (Note: The Shutter channel must be set to "0" to access Control channel settings.)	Safe (disables all Control settings)	0-9	0-4	00-09
		Home	60-68	24-27	3C-44
		Lamp On	80-88	31-35	50-58
		Lamp Off	90-98	35-38	5A-62
		Shutdown*	120-130	47	78

*\*Note: Fixture shutdown allows you to remotely deactivate the fixture. When a fixture is shut down, the lamp is extinguished, and power to the motors is disabled. If a fixture is in shutdown mode, you must home the fixture to bring it back into operation.*



# Studio Beam PC DMX Protocol Chart

DMX	Function	Description	Decimal	Percent	Hex
<b>1</b>	<b>Pan</b>	<b>Pan Coarse</b>	0 - 255	0-100	0-FF
<b>2</b>	<b>Pan</b>	<b>Pan Fine</b>	0 - 255	0-100	0-FF
<b>3</b>	<b>Tilt</b>	<b>Tilt Coarse</b>	0 - 255	0-100	0-FF
<b>4</b>	<b>Tilt</b>	<b>Tilt Fine</b>	0 - 255	0-100	0-FF
<b>5</b>	<b>Color Function</b>	<b>Full Speed</b>			
		Continuous	0-15	0-6	0-0F
		Indexed	16-31	6-12	10-1F
		Pure Mix	32-47	13-18	20-2F
		Spin	48-63	19-25	30-3F
		Cycle	64-79	25-31	40-4F
		Media Scan	80-95	31-37	50-5F
		Random	96-111	38-44	60-6F
		Blink-Continuous	112-127	44-50	70-7F
		<b>MSpeed Controlled</b>			
		Continuous	128-143	50-56	80-8F
		Indexed	144-159	57-62	90-9F
		Pure Mix	160-175	63-69	A0-AF
		Spin	176-191	69-75	B0-BF
		Cycle	192-207	75-81	C0-CF
		Media Scan	208-223	82-88	D0-DF
		Random	224-239	88-94	E0-EF
		Blink-Continuous	240-255	94-100	F0-FF
<b>6</b>	<b>Cyan Color Wheel</b>	<b>Continuous Mode</b>			
		Open	0	0	0
		Color 1	57	22	39
		Cyan In (Full saturation)	105	41	69
		Cyan Out (Low saturation)	255	100	FF
		<b>Indexed Mode</b>			
		Open	0-15	0-6	0-0F
		Color 1	16-47	6-18	10-2F



		Cyan Full Saturation	48-79	19-31	30-4F
		Cyan Med. High Saturation	80-111	31-44	50-6F
		Cyan Medium 1 Saturation	112-143	44-56	70-8F
		Cyan Medium 2 Saturation	144-175	56-69	90-AF
		Cyan Med. Low Saturation	176-207	69-81	B0-CF
		Cyan Low Saturation	208-239	82-94	D0-EF
		Open	240-255	94-100	F0-FF
		<b>Pure Mix Mode</b>			
		Cyan In (Full saturation)	0	0	0
		Cyan Out (Low saturation)	255	100	FF
		<b>Spin Mode</b>			
		Continuous Positioning	0-127	0-50	0-7F
		Spin Reverse Fastest	128	50	80
		Spin Reverse Slowest	187	73	BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward Slowest	196	77	C4
		Spin Forward Fastest	255	100	FF
		<b>Media Scan</b>			
		Continuous Positioning	0-127	0-50	0-7F
		Media Scan Slowest	128	50	80
		Media Scan Fastest	255	100	FF
		<b>Cycle &amp; Random Modes</b>			
		Slow Rate	0	0	0
		Fast Rate	255	100	FF
7	Magenta Color Wheel	<b>Continuous Mode</b>			
		Open	0	0	0
		Color 1	57	22	39
		Magenta In (Full saturation)	105	41	69
		Magenta Out(Low saturation)	255	100	FF
		<b>Indexed Mode</b>			
		Open	0-15	0-6	0-0F
		Color 1	16-47	6-18	10-2F
		Magenta Full Saturation	48-79	19-31	30-4F
		Mag. Med. High Saturation	80-111	31-44	50-6F
		Mag. Medium 1 Saturation	112-143	44-56	70-8F
		Mag. Medium 2 Saturation	144-175	56-69	90-AF

		Mag. Med. Low Saturation	176-207	69-81	B0-CF
		Mag. Low Saturation	208-239	82-94	D0-EF
		Open	240-255	94-100	F0-FF
		Pure Mix Mode			
		Magenta In (Full saturation)	0	0	0
		Magenta Out(Low saturation)	255	100	FF
		Spin Mode			
		Continuous Positioning	0-127	0-50	0-7F
		Spin Reverse Fastest	128	50	80
		Spin Reverse Slowest	187	73	BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward Slowest	196	77	C4
		Spin Forward Fastest	255	100	FF
		Media Scan			
		Continuous Positioning	0-127	0-50	0-7F
		Media Scan Slowest	128	50	80
		Media Scan Fastest	255	100	FF
		Cycle & Random Modes			
		Slow Rate	0	0	0
		Fast Rate	255	100	FF
8	Yellow Color Wheel	Continuous Mode			
		Open	0	0	0
		Color 1	57	22	39
		Yellow In (Full saturation)	105	41	69
		Yellow Out (Low saturation)	255	100	FF
		Indexed Mode			
		Open	0-15	0-6	0-0F
		Color 1	16-47	6-18	10-2F
		Yellow Full Saturation	48-79	19-31	30-4F
		Yellow Med. High Saturation	80-111	31-44	50-6F
		Yellow Medium 1 Saturation	112-143	44-56	70-8F
		Yellow Medium 2 Saturation	144-175	56-69	90-AF
		Yellow Med. Low Saturation	176-207	69-81	B0-CF
		Yellow Low Saturation	208-239	82-94	D0-EF
		Open	240-255	94-100	F0-FF
		Pure Mix Mode			
		Yellow In (Full saturation)	0	0	0

		Yellow Out (Low saturation)	255	100	FF
		<b>Spin Mode</b>			
		Continuous Positioning	0-127	0-50	0-7F
		Spin Reverse Fastest	128	50	80
		Spin Reverse Slowest	187	73	BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward Slowest	196	77	C4
		Spin Forward Fastest	255	100	FF
		<b>Media Scan</b>			
		Continuous Positioning	0-127	0-50	0-7F
		Media Scan Slowest	128	50	80
		Media Scan Fastest	255	100	FF
		<b>Cycle &amp; Random Modes</b>			
		Slow Rate	0	0	0
		Fast Rate	255	100	FF
<b>9</b>	<b>Beam Shaping</b>	<b>Variable Ranges</b>			
	(Lenticular Wheel)	Continuous Positioning	0-127	0-50	0-7F
		Spin Reverse Fastest	128	50	80
		Spin Reverse Slowest	187	73	BB
		Spin Stop	188-195	74-76	BC-C3
		Spin Forward Slowest	196	77	C4
		Spin Forward Fastest	255	100	FF
<b>10</b>	<b>Zoom</b>	<b>Variable Range</b>			
		Zoom In	0	0	0
		Zoom Out	255	100	FF
<b>11</b>	<b>Frost</b>	<b>Variable Frost</b>			
		No frost	0	0	0
		Variable	1-126	1-48	1-7E
		Full Frost	128-135	50-53	80-87
		<b>Frost Effects (Variable Ranges)</b>			
		Frost Strobe	136-151	53-59	88-97
		Random Frost Strobe	152-167	60-65	98-A7
		Ramp Open/ Snap Shut	168-183	66-72	A8-B7
		Snap Open/ Ramp Shut	184-199	72-78	B8-C7
		Ramp Open/ Ramp Shut	200-245	78-84	C8-D7
		Random ramp/ snap	216-231	85-91	D8-E7
		Random snap/ ramp	232-247	91-97	E8-F7
		Open	248-255	97-100	F8-FF
<b>12</b>	<b>Shutter</b>	<b>Normal Functions</b>			



Close	0-23	0-9	0-17
Open	232-255	91-100	E8-FF
<b>Strobe Effects (Variable Ranges)*</b>			
Periodic Strobe	24-49	9-19	18-31
Random/Rand Strobe	50-75	20-29	32-4B
Random/Sync Strobe	76-101	30-40	4C-65
Ramp Open/Snap Shut	102-127	40-50	66-7F
Snap Open/Ramp Shut	128-153	50-60	80-99
Ramp Open/Ramp Shut	154-179	60-70	9A-B3
Random Ramp/Snap	180-205	71-80	B4-CD
Random Snap/Ramp	206-231	81-91	CE-E7
<b>*Additional lamp assisted strobes</b> (Can be accessed when the Control channel is set in the range 134-137)			
The shutter functions are the same as in the normal shutter function range. Periodic strobes, random random and random synchronous strobes are lamp assisted.			
<b>Lamp functions</b> (Accessed when the Control channel is set in the range 138-141. Notes 5 & 6)			
Close	0-23	0-9	0-17
Open	232-255	91-100	E8-FF
Periodic Strobe	24-49	9-19	18-31
Random/Rand Lamp Strobe	50-75	20-29	32-4B
Random/Sync Lamp Strobe	76-101	30-40	4C-65
Boost Lamp 1.0 Sec., Black	102-105	40-41	66-69
Boost Lamp .75 Sec., Black	106-109	42-43	6A-6D
Boost Lamp .66 Sec., Black	110-113	43-44	6E-71
Boost Lamp .5 Sec., Black	114-117	45-46	72-75
Boost Lamp .33 Sec., Black	118-121	46-47	76-79
Boost Lamp .25 Sec., Black	122-127	48-50	7A-7F
Boost Lamp 1.0 Sec., White	102-105	50-51	80-83
Boost Lamp .75 Sec., White	106-109	52-53	84-87
Boost Lamp .66 Sec., White	110-113	53-54	88-8B
Boost Lamp .5 Sec., White	114-117	55-56	8C-8F
Boost Lamp .33 Sec., White	118-121	56-57	90-93
Boost Lamp .25 Sec., White	122-127	58-60	94-99

		Lightning strike 1	154-157	60-62	9A-9D
		Lightning strike 2	158-161	62-63	9E-A1
		Lightning strike 3	162-165	64-65	A2-A5
		Lightning strike 4	166-169	65-66	A6-A9
		Lightning strike 5	170-173	67-68	AA-AD
		Lightning strike 6	174-179	68-70	AE-B3
		TBD - Default Black	180-231	71-91	B4-E7
		<b>Lamp Dimming only</b> (Accessed when the Control Channel is set in the range 146-149. Note 4)			
		The shutter functions are the same as in the normal shutter range. Dimming is accomplished electronically, lowering the lamp power. Dimming will not go to black. Strobes are mechanical and will go to black.			
<b>13</b>	<b>Dimmer</b>	<b>Variable Range</b>			
		Closed	0	0	0
		Open	255	100	FF
<b>14</b>	<b>MSpeed</b>	<b>Ranges</b>			
		Controller crossfade	0-3	0-1	0-3
		Longest (252.7 sec.)	4	2	4
		Shortest (0.15 sec.)	255	100	FF
<b>15</b>	<b>Macros</b>	<b>Selections</b>			
		No Macro / LAD off	0-7	0-3	0-07
		Macro 1	8-11	3-4	08-0B
		Macro 2	12-15	5-6	0C-0F
		Macro 3	16-19	6-8	10-13
		Macro 4	20-23	8-9	14-17
		Macro 5	24-27	9-11	18-1B
		Macro 6	28-31	11-12	1C-1F
		Macro 7	32-35	13-14	20-23
		Macro 8	36-39	14-15	24-27
		Macro 9	40-43	16-17	28-2B
		Macro 10	44-47	17-18	2C-2F
		Macro 11	48-51	19-20	30-33
		Macro 12	52-55	20-22	34-37
		Macro 13	56-59	22-23	38-3B
		Macro 14	60-63	24-25	3C-3F
		Macro 15	64-67	25-26	40-43
		Macro 16	68-71	27-28	44-47
		Macro 17	72-75	28-29	48-4B
		Macro 18	76-79	30-31	4C-4F
		Macro 19	80-83	31-33	50-53
		Macro 20	84-87	33-34	54-57
		Macro 21	88-91	35-36	58-5B
		Macro 22	92-95	36-37	5C-5F
		Macro 23	96-99	38-39	60-63
		Macro 24	100-103	39-40	64-67
		Macro 25	104-107	41-42	68-6B

		Macro 26	108-111	42-44	6C-6F
		Macro 27	112-115	44-45	70-73
		Macro 28	116-119	46-47	74-77
		Macro 29	120-123	47-48	78-7B
		Macro 30	124-127	49-50	7C-7F
		Macro 31	128-131	50-51	80-83
		Macro 32	132-135	52-53	84-87
		Random Macros (Variable)	136-167	53-66	88-A7
		Reserved For Future Use	168-255	66-100	A8-FF
<b>16</b>	<b>Control</b>	<b>Selections</b>			
	<p>After choosing a control channel value, set the Shutter channel to "O" to access the Control channel settings</p> <p>&gt; Send values for .5 seconds (20 Packets)</p> <p>&gt; Send "Shutdown" and "Lock" value for approximately two seconds (80 Packets)</p>	Safe (normal operation)	0-9	0-3	0-9
		Disable MSpeed for P/T	10-19	4-7	0A-13
		Display off	20-28	8-11	14-1C
		Display dim	30-38	12-14	1E-26
		Display bright	40-48	15-18	28-30
		Home	60-68	23-26	3C-44
		Lamp on	80-88	31-34	50-58
		Lamp off	90-98	35-38	5A-62
		Lock	110-118	43-46	6E-76
		Shutdown	120-130	46-50	78-82
		Reserved			
		Lamp Assist Strobe (Note 1)	134-137	53-54	86-89
		Lamp Functions (Note 2)	138-141	54-55	8A-8D
		Lamp/Mech. Dim (Note 3)	142-145	56-57	8E-91
		Lamp Only Dimming (Note 4)	146-149	57-58	92-95
		Reserved For Future Use	150-255	59-100	96-FF



## NOTES:

- 1.) Only the periodic and random strobe functions are lamp assisted. The ramping functions are not lamp assisted.
- 2.) Modifies the shutter channel.
- 3.) The lamp can be dimmed to about 325 Watts. The lamp will vary from 325 Watts to 700 Watts as the mechanical dimming ranges from 0% to 100%.
- 4.) Only the lamp is dimmed. See note 3.
- 5.) The lamp will be boosted above the 700 Watt level for the specified period of time. The lamp is also boosted during the lightning effects. Before another boost or lightning effect can occur, the shutter channel must be moved to either closed or open, or the control channel must be moved outside the lamp function range. Boost functions to black will boost the lamp for the specified time then close the shutter. Boost functions to white will boost the lamp for the specified time, then leave the shutter open with the lamp idled at 325 Watts.
- 6.) When the lightning functions are selected, the dim channel will scale the overall brightness of the lightning stroke. Dim at 255 will yield maximum brightness.

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Proprietary Notice

# Color Pro<sup>®</sup> DMX Protocol

## DMX Construct Parameters in Standard Protocol

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
1	Dim	Continuous dimming (closed to open)	0-127	0-49	00-7F
		Open	128-143	50-56	80-8F
		Periodic Strobe	144-187	57-73	90-BB
		Open	188-195	74-77	BC-C3
		Random Strobe	196-239	77-94	C4-EF
		Open	240-255	94-100	F0-FF
2	Red (-Cyan)	Continuous Mode			
		Red 0%	0	0	00
		Red Full	244-255	96-100	F4-FF
3	Green (-Magenta)	Continuous Mode			
		Green 0%	0	0	00
		Green Full	244-255	96-100	F4-FF
4	Blue (-Yellow)	Continuous Mode			
		Blue 0%	0	0	00
		Blue Full	244	96	F4
		UV (Note: The Red and Green channels must be set to "0" to access UV.)	255	100	FF
5	Effects (Color Pro HX only)	Continuous Positioning (open at 0)	0-127	0-50	00-7F
		Spin Reverse (fast to slow)	128-187	50-73	80-BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward (slow to fast)	196-255	77-100	C4-FF
	Effects (Color Pro FX only)	Continuous Positioning (open at 64)	0-127	0-50	00-7F
		Twinkle Scan (fast to slow)	128-187	50-73	80-BB
		Scan Stop	188-195	74-77	BC-C3
		Color Scan (slow to fast)	196-255	77-100	C4-FF
6	Iris (Color Pro HX-i only)	Continuous Positioning (closed to open)	0-255	0-100	00-FF
	Control (Note: The Dim channel must be set to "0" to access Control channel settings.)	Safe	0-9	0-4	00-09
		Display Off	20-28	8-11	14-1C
		Display Dim	30-38	12-15	1E-26
		Display Bright	40-48	16-19	28-30
		Home	60-68	24-27	3C-44
		Lamp On	80-88	31-35	50-58
		Lamp Off	90-98	35-38	5A-62
		Shutdown* (send this value for 2 seconds)	120-130	47-51	78-82

\*Note: Fixture shutdown allows you to remotely deactivate the fixture. When a fixture is shut down, the lamp is extinguished, power to the motors is disabled, and the LED display shows "SHUT OFF." If a fixture is in shutdown mode, you must home the fixture to bring it back into operation.

*DMX Construct Parameters in Enhanced Protocol*

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
1	Dim	Continuous Positioning (closed to open)	0-255	0-100	00-FF
2	Shutter (Note: Snap instantly opens or closes at full speed. Ramp opens or closes at specified speeds.)	Close	0-31	0-12	00-1F
		Periodic Strobe (Variable)	32-63	13-25	20-3F
		Random/Rand Strobe (Variable)	64-95	25-37	40-5F
		Random/Sync (Variable)	96-127	38-50	60-7F
		Ramp Open/Ramp Shut (Variable)	128-159	50-62	80-9F
		Random Ramp/Ramp (Variable)	160-191	63-75	A0-BF
		TBD (Reserved for future use)	192-223	75-88	C0-DF
		Open	224-255	88-100	E0-FF
3	Color Function	Full Speeds			
		Continuous	0-15	0-6	00-0F
		Indexed (Divides the wheel into 8 equal sections)	16-31	6-12	10-1F
		Pure Mix (Only accesses the portion of the wheel used for color mixing)	32-47	13-18	20-2F
		Spin (Puts all the color wheels in spin mode. Wheel spin speed, direction, or fixed position can be set individually on Red, Green, and Blue channels)	48-63	19-25	30-3F
		Cycle (3 wheels use color mix portion to cycle colors. Rate set by Red channel)	64-79	25-31	40-4F
		Color Scan (Puts all the color wheels in scan mode. Scans only the continuous color portion of the wheel - not the open "white" portion. Fixed position or scanning speed can be set individually on Red, Green, and Blue channels)	80-95	31-37	50-5F
		Random (3 wheels perform pseudo-random color chase. Rate set by Red channel)	96-111	38-44	60-6F
		Blink-Indexed (Blink Mode is defined using Indexed wheel operation)	112-127	44-50	70-7F
		MSpeed Controlled (see above for function descriptions)			
		Continuous	128-143	50-56	80-8F
		Indexed	144-159	57-62	90-9F
		Pure Mix	160-175	63-69	A0-AF
		Spin	176-191	69-75	B0-BF
		Cycle	192-207	75-81	C0-CF
		Color Scan	208-223	82-88	D0-DF
		Random	224-239	88-94	E0-EF
		Blink-Indexed	240-255	94-100	F0-FF
4	Red (-Cyan)	Continuous Mode			
		Open	0	0	00
		Color 1 (open "white" position)	42	17	2A
		Color 2 (open "white" position)	85	33	55



*DMX Construct Parameters in Enhanced Protocol*

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
4 (cont.)	Red (-Cyan) (cont.)	Red 0%	127	50	7F
		Red Full	255	100	FF
		Indexed Mode			
		Open	0-15	0-6	00-0F
		Color 1 (open "white" position)	16-47	6-18	10-2F
		Color 2 (open "white" position)	48-79	19-31	30-4F
		Red Low	80-111	31-44	50-5F
		Red Med Low	112-143	44-56	70-8F
		Red Medium	144-175	57-69	90-AF
		Red Med High	176-207	69-81	B0-CF
		Red Full	208-239	82-94	D0-EF
		Open	240-255	94-100	F0-FF
		Pure Mix Mode			
		Red 0%	0	0	00
		Red Full	255	100	FF
		Spin Mode			
		Continuous Positioning	0-127	0-50	00-7F
		Spin Reverse (fast to slow)	128-187	50-73	80-BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward (slow to fast)	196-255	77-100	C4-FF
		Color Scan Mode			
		Continuous Positioning	0-127	0-50	00-7F
		Scanning (slow to fast)	128-255	50-100	80-FF
		Cycle & Random Modes			
		Slow Rate	0	0	00
		Fast Rate	255	100	FF
5	Green (-Magenta)	Continuous Mode			
		Open	0	0	00
		Color 1 (open "white" position)	42	17	2A
		Color 2 (open "white" position)	85	33	55
		Green 0%	127	50	7F
		Green Full	255	100	FF
		Indexed Mode			
		Open	0-15	0-6	00-0F
		Color 1 (open "white" position)	16-47	6-18	10-2F
		Color 2 (open "white" position)	48-79	19-31	30-4F
		Green Low	80-111	31-44	50-5F
		Green Med Low	112-143	44-56	70-8F
		Green Medium	144-175	57-69	90-AF
		Green Med High	176-207	69-81	B0-CF
		Green Full	208-239	82-94	D0-EF
		Open	240-255	94-100	F0-FF
		Pure Mix Mode			
		Green 0%	0	0	00
		Green Full	255	100	FF
		Spin Mode			
		Continuous Positioning	0-127	0-50	00-7F
		Spin Reverse (fast to slow)	128-187	50-73	80-BB

. DMX Construct Parameters in Enhanced Protocol

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
5 (cont.)	Green (-Magenta) (cont.)	Spin Stop	188-195	74-77	BC-C3
		Spin Forward (slow to fast)	196-255	77-100	C4-FF
		Color Scan Mode			
		Continuous Positioning	0-127	0-50	00-7F
		Scanning (slow to fast)	128-255	50-100	80-FF
6	Blue (-Yellow)	Continuous Mode			
		Open	0	0	00
		UV	42	17	2A
		Color 2 (open "white" position)	85	33	55
		Blue 0%	127	50	7F
		Blue Full	255	100	FF
		Indexed Mode			
		Open	0-15	0-6	00-0F
		UV	16-47	6-18	10-2F
		Color 2 (open "white" position)	48-79	19-31	30-4F
		Blue Low	80-111	31-44	50-5F
		Blue Med Low	112-143	44-56	70-8F
		Blue Medium	144-175	57-69	90-AF
		Blue Med High	176-207	69-81	B0-CF
		Blue Full	208-239	82-94	D0-EF
		Open	240-255	94-100	F0-FF
		Pure Mix Mode			
		Blue 0%	0	0	00
		Blue Full	255	100	FF
		Spin Mode			
		Continuous Positioning	0-127	0-50	00-7F
		Spin Reverse (fast to slow)	128-187	50-73	80-BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward (slow to fast)	196-255	77-100	C4-FF
		Color Scan Mode			
		Continuous Positioning	0-127	0-50	00-7F
		Scanning (slow to fast)	128-255	50-100	80-FF
7	Effects (HX Model)	Continuous Positioning	0-127	0-50	00-7F
		Spin Reverse (fast to slow)	128-187	50-73	80-BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward (slow to fast)	196-255	77-100	C4-FF
	Effects (FX Model)	Continuous Positioning	0-127	0-50	00-7F
		Twinkle Scan (fast to slow)	128-187	50-73	80-BB
		Scan Stop	188-195	74-77	BC-C3
		Color Scan (slow to fast)	196-255	77-100	C4-FF

## DMX Construct Parameters in Enhanced Protocol

Channel	Construct	Description	Value (dec.)	Value (%)	Value (hex)
7 (cont.)	Iris (HX-i Model) (Note: Snap instantly opens or closes at full speed. Ramp opens or closes at specified speeds.)	Close	0	0	00
		Variable Iris	1-127	1-50	01-7F
		Open	128-135	50-53	80-87
		Periodic Strobe (Variable)	136-151	53-60	88-97
		Random Strobe (Variable)	152-167	60-66	98-A7
		Ramp Open/Snap Shut (Variable)	168-183	66-72	A8-B7
		Snap Open/Ramp Shut (Variable)	184-199	72-78	B8-C7
		Ramp Open/Ramp Shut (Variable)	200-215	78-84	C8-D7
		Random Ramp Open/Snap Shut (Variable)	216-231	85-91	D8-E7
		Random Snap Open/Ramp Shut (Variable)	232-247	91-97	E8-F7
		Open	248-255	97-100	F8-FF
8	MSpeed (see Table A-2 on page A-2)	Disable	0-3	0-1	00
		Longest (252.7 sec.)	4	2	04
		Shortest (0.15 sec.)	255	100	FF
9	Control (Note: The Shutter channel must be set to "0" to access Control channel settings.)	Safe (disables all Control settings)	0-9	0-4	00-09
		Display Off	20-28	8-11	14-1C
		Display Dim	30-38	12-15	1E-26
		Display Bright	40-48	16-19	28-30
		Home	60-68	24-27	3C-44
		Lamp On	80-88	31-35	50-58
		Lamp Off	90-98	35-38	5A-62
		Shutdown*	120-130	47-51	78-82

\*Note: Fixture shutdown allows you to remotely deactivate the fixture. When a fixture is shut down, the lamp is extinguished, power to the motors is disabled, and the LED display shows "SHUT OFF." If a fixture is in shutdown mode, you must home the fixture to bring it back into operation.





# Studio Spot 575

## DMX Protocol Chart

DMX	Function	Description	Decimal	Percent	Hex
1	Pan MSB	Coarse Positioning, 8 bit	0-255	0-100	0-FF
2	Pan LSB	Fine Positioning	0-255	0-100	0-FF
3	Tilt MSB	Coarse Positioning, 8 bit	0-255	0-100	0-FF
4	Tilt LSB	Fine Positioning	0-255	0-100	0-FF
5	Color Wheel 1 Function	<b>Full Speeds</b>			
		Indexed	0-31	0-12	0-1F
		Forward spin	32-47	13-18	2D-2F
		Reverse spin	48-63	16-24	30-3F
		Continuous	64-79	25-30	40-4F
		Fast scan	80-87	31-33	50-57
		Slow scan	88-95	34-37	58-5F
		Random	96-111	37-43	60-6F
		Blink-indexed	112-127	44-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-159	50-62	80-9F
		Forward Spin	160-175	63-68	A0-AF
		Reverse Spin	176-191	69-74	B0-BF
		Continuous	192-207	75-80	C0-CF
		Fast scan	208-215	81-83	D0-D7
		Slow scan	216-223	84-87	D8-DF
		Random	224-239	88-93	E0-EF
		Blink-indexed	240-255	94-100	F0-FF
6	Color Wheel 1 Position	<b>Indexed Mode</b>			
		Color 1	0-19	0-7	0-13
		Color 1 and 2	20-39	8-15	14-27
		Color 2	40-59	16-23	28-3B
		Color 2 and 3	60-78	24-30	3C-4E
		Color 3	79-98	31-38	4F-62
		Color 3 and 4	99-118	39-46	63-76
		Color 4	119-137	47-53	77-89
		Color 4 and 5	138-157	54-61	8A-9D
		Color 5	158-177	62-69	9E-B1
		Color 5 and 6	178-196	70-76	B2-C4

6	Combined Modes	Color 6	197-216	77-84	C5-D8
		Color 6 and 1	217-236	85-92	D9-EC
		Color 1	237-255	93-100	ED-FF
		<b>Continuous Mode</b>			
		Color 1	0	0	0
		Color 2	39	15	27
		Color 3	88	35	58
		Color 4	134	52	86
		Color 5	169	66	A9
		Color 6	213	83	D5
		Color 1	255	100	FF
		<b>Continuously Variable Forward Spin Mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	255	100	FF
		<b>Continuously Variable Reverse Spin Mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	255	100	FF
		<b>Random Mode</b>			
		Random stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
		<b>Combined Wheel Operation Mode</b>			
		Color 1	0-6	0-2	0-6
		Color 2	7-13	3-5	7-0D
		Color 3	14-20	6-7	0E-14
		Color 4	21-27	8-10	15-1B
		Color 5	28-34	11-13	1C-22
		Color 6	35-41	14-16	23-29
		Color 7	42-47	17-18	2A-2F
		Color 8	48-54	19-21	30-36
		Color 9	55-61	22-23	37-3D
		Color 10	62-68	24-26	3E-44
		Color 11	69-75	27-29	45-4B
		Color 12	76-82	30-32	4C-52
		Color 13	83-89	33-34	53-59
		Color 14	90-96	35-37	5A-60
		Color 15	97-103	38-40	61-67
		Color 16	104-110	41-42	68-6E
		Color 17	111-117	43-45	6F-75
		Color 18	118-124	46-48	76-7C
		Color 19	125-130	49-50	7D-82
		Color 20	131-137	51-53	83-89
		Color 21	138-144	54-56	8A-90
		Color 22	145-151	57-58	91-97
		Color 23	152-158	59-61	98-9E
		Color 24	159-165	61-64	9F-A5
		Color 25	166-172	65-67	A6-AC
		Color 26	173-179	68-69	AD-B3
		Color 27	180-186	70-72	B4-BA
		Color 28	187-193	73-75	BB-C1
		Color 29	194-200	76-78	C2-C8

	Note: Combined mode is set on the Function Channel on the second color wheel.	Color 30	201-207	79-80	C9-CF
		Color 31	208-213	81-83	D0-D2
		Color 32	214-220	84-85	D3-D9
		Color 33	221-227	86-88	DA-E3
		Color 34	228-234	89-91	E4-EA
		Color 35	235-241	92-94	EB-F1
		Color 36	242-248	95-96	F2-F8
		Color 1	249-255	97-100	F9-FF
		<b>Continuously Variable, 360° Mode</b>			
		Color 1	0	0	0
		Color 2	7	3	7
		Color 3	14	6	0E
		Color 4	21	8	15
		Color 5	28	11	1C
		Color 6	35	14	23
		Color 7	42	17	2A
		Color 8	49	19	31
		Color 9	56	21	38
		Color 10	63	24	3F
		Color 11	70	27	46
		Color 12	77	30	4D
		Color 13	84	32	54
		Color 14	91	35	5B
		Color 15	98	38	62
		Color 16	105	41	69
		Color 17	112	43	70
		Color 18	119	46	77
		Color 19	126	49	7E
		Color 20	133	51	85
		Color 21	140	54	8C
		Color 22	147	57	93
		Color 23	154	60	9A
		Color 24	161	62	A1
		Color 25	168	65	A8
		Color 26	175	68	AE
		Color 27	182	71	B6
		Color 28	189	73	BD
		Color 29	196	76	C4
		Color 30	203	79	CB
		Color 31	210	82	DF
		Color 32	217	84	D6
		Color 33	224	87	E0
		Color 34	231	90	E7
		Color 35	238	92	EE
		Color 36	245	95	F5
		Color 1	252	98	FC
<b>7</b>	<b>Color Wheel 2 Function</b>	<b>Full Speeds</b>			
		Combined Operation	0-15	0-5	0-F
		Indexed	16-31	6-12	10-1F
		Forward spin	32-47	13-18	2D-2F
		Reverse spin	48-63	16-24	30-3F
		Continuous	64-79	25-30	40-4F
		Fast scan	80-87	31-33	50-57



		Slow scan	88-95	34-37	58-5F
		Random	96-111	37-43	60-6F
		Blink-indexed	112-127	44-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-159	50-62	80-9F
		Forward Spin	160-175	63-68	A0-AF
		Reverse Spin	176-191	69-74	B0-BF
		Continuous	192-207	75-80	C0-CF
		Fast scan	208-215	81-83	D0-D7
		Slow scan	216-223	84-87	D8-DF
		Random	224-239	88-93	E0-EF
		Blink-indexed	240-255	94-100	F0-FF
<b>8</b>	<b>Color Wheel 2 Position</b>	<b>Indexed Mode</b>			
		Color 1	0-19	0-7	0-13
		Color 1 and 2	20-39	8-15	14-27
		Color 2	40-59	16-23	28-3B
		Color 2 and 3	60-78	24-30	3C-4E
		Color 3	79-98	31-38	4F-62
		Color 3 and 4	99-118	39-46	63-76
		Color 4	119-137	47-53	77-89
		Color 4 and 5	138-157	54-61	8A-9D
		Color 5	158-177	62-69	9E-B1
		Color 5 and 6	178-196	70-76	B2-C4
		Color 6	197-216	77-84	C5-D8
		Color 6 and 1	217-236	85-92	D9-EC
		Color 1	237-255	93-100	ED-FF
		<b>Continuous Mode</b>			
		Color 1	0	0	0
		Color 2	39	15	27
		Color 3	88	35	58
		Color 4	134	52	86
		Color 5	169	66	A9
		Color 6	213	83	D5
		Color 1	255	100	FF
		<b>Continuously Variable Forward Spin Mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	255	100	FF
		<b>Continuously Variable Reverse Spin Mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	255	100	FF
		<b>Random Mode</b>			
		Random stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
<b>9</b>	<b>Litho Wheel 1 Function</b>	<b>Full Speed</b>			
		Indexed	0-15	0-5	0-0F
		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Wheel spin	48-63	19-24	30-3F

		Fast scan-indexed	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		Blink wheel	96-111	38-42	60-6F
		Blink aperture	112-127	43-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-143	50-55	80-8F
		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Wheel spin	176-191	69-74	B0-BF
		Fast Scan-indexed	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		Blink wheel	224-239	88-93	E0-EF
		Blink aperture	240-255	94-100	F0-FF
<b>10</b>	<b>Litho Wheel 1 Position</b>	<b>Indexed Positions</b>			
		Position 0	0-36	0-14	0-24
		Position 1	37-73	15-28	25-49
		Position 2	74-109	29-42	4A-6D
		Position 3	110-146	43-57	6E-92
		Position 4	147-182	58-71	93-B6
		Position 5	183-219	72-85	B7-D8
		Position 0	220-255	86-100	D9-FF
<b>11</b>	<b>Litho Wheel 1 Rotation</b>	<b>Indexed mode</b>			
	High Byte	Indexable Positions	0-255	0-100	0-FF
		<b>Variable forward spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	225	100	FF
		<b>Variable reverse spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	225	100	FF
		<b>Continuously variable spin mode</b>			
		Fastest forward spin	0	0	0
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		<b>Scan mode</b>			
		Scan slowest	0	0	0
		Scan fastest	255	100	FF
		<b>Random Mode</b>			
		Spin stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
<b>12</b>	<b>Litho Wheel 1 Rotation</b>	<b>Indexed Mode</b>			
	Low Byte	Fine Adjust (16-bit)	0-255	0-100	0-FF
<b>13</b>	<b>Litho Wheel 2 Function</b>	<b>Full Speed</b>			
		Indexed	0-15	0-5	0-0F
		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Wheel spin	48-63	19-24	30-3F

		Fast scan-indexed	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		Blink wheel	96-111	38-42	60-6F
		Blink aperture	112-127	43-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-143	50-55	80-8F
		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Wheel spin	176-191	69-74	B0-BF
		Fast Scan-indexed	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		Blink wheel	224-239	88-93	E0-EF
		Blink aperture	240-255	94-100	F0-FF
<b>14</b>	<b>Litho Wheel 2 Position</b>	<b>Indexed Positions</b>			
		Position 0	0-36	0-14	0-24
		Position 1	37-73	15-28	25-49
		Position 2	74-109	29-42	4A-6D
		Position 3	110-146	43-57	6E-92
		Position 4	147-182	58-71	93-B6
		Position 5	183-219	72-85	B7-D8
		Position 0	220-255	86-100	D9-FF
<b>15</b>	<b>Litho Wheel 2 Rotation</b>	<b>Indexed mode</b>			
	High Byte	Indexable Positions	0-255	0-100	0-FF
		<b>Variable forward spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	225	100	FF
		<b>Variable reverse spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	225	100	FF
		<b>Continuously variable spin mode</b>			
		Fastest forward spin	0	0	0
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		<b>Scan mode</b>			
		Scan slowest	0	0	0
		Scan fastest	255	100	FF
		<b>Random Mode</b>			
		Spin stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
<b>16</b>	<b>Litho Wheel 2 Rotation</b>	<b>Indexed Mode</b>			
	Low Byte	Fine Adjust (16-bit)	0-255	0-100	0-FF
<b>17</b>	<b>Frost</b>	<b>Variable Frost</b>			
		No frost	0	0	0
		Variable	1-126	1-48	1-7E
		Full Frost	127	49	7F
		<b>Frost Effects (Variable Ranges)</b>			



		Slow frost strobe	128-143	50-55	80-8F
		Fast frost strobe	144-159	56-62	90-9F
		Ramp open/ snap shut	160-175	63-68	A0-AF
		Snap open/ ramp shut	176-191	69-74	B0-BF
		Random ramp/ snap	192-207	75-80	C0-CF
		Random snap/ ramp	208-223	81-87	D0-DF
		Open	224-255	88-100	E0-FF
<b>18</b>	<b>Focus</b>	<b>Variable Focus</b>			
		Focus image closer	0	0	0
		Focus image farther	256	100	FF
<b>19</b>	<b>Iris</b>	<b>Variable Iris</b>			
		Closed	0	0	0
		Variable	1-127	1-49	1-7F
		Open	128-143	50-55	80-8F
		<b>Iris Effects (Variable Ranges)</b>			
		Periodic strobe	144-159	56-62	90-9F
		Random strobe	160-175	63-68	A0-AF
		Ramp open/ snap shut	176-191	69-74	B0-BE
		Snap open/ ramp shut	192-207	75-80	BF-CF
		Random ramp/ snap	208-223	81-87	DD-DC
		Random snap/ ramp	224-239	88-93	E0-EF
		Open	240-255	94-100	F0-FF
<b>20</b>	<b>Shutter</b>	<b>Normal</b>			
		Closed	0-31	0-12	0-1F
		Open	224-255	88-100	E0-FF
		<b>Strobe Effects</b>			
		Variable speed	32-63	13-24	20-3F
		Random	64-95	25-37	40-5F
		Ramp open/ snap shut	96-127	38-49	60-7F
		Snap open/ ramp shut	128-159	50-62	80-9F
		Random ramp/ snap	160-191	63-74	A0-BF
		Random snap/ ramp	192-223	75-87	C0-DF
<b>21</b>	<b>Dimmer</b>	<b>Variable Range</b>			
		Open	0	0	0
		Closed	255	100	FF
<b>22</b>	<b>MSpeed</b>	<b>Ranges</b>			
		Controller crossfade	0-3	0-1	0-3
		Longest (252.7 sec.)	4	2	4
		Shortest (0.15 sec.)	255	100	FF
<b>23</b>	<b>Macros</b>	<b>Selections</b>			
		No macro	0-7	0-2	0-7
		Macro 1	8-15	3-5	8-0F
		Macro 2	16-23	6-9	10-17
		Macro 3	24-31	10-12	18-1F
		Macro 4	32-39	13-15	20-27
		Macro 5	40-47	16-18	28-2F

		Macro 6	48-55	19-21	30-37
		Macro 7	56-63	22-24	38-3F
		Macro 8	64-71	25-27	40-47
		Macro 9	72-79	28-30	48-4F
		Macro 10	80-87	31-34	50-57
		Macro 11	88-95	35-37	58-5F
		Macro 12	96-103	38-40	60-67
		Macro 13	104-111	41-43	68-6F
		Macro 14	112-119	44-46	70-77
		Macro 15	120-127	47-49	78-7F
		Macro 16	128-135	50-52	80-87
		Macro 17	136-143	53-55	88-8F
		Macro 18	144-151	56-59	90-97
		Macro 19	152-159	60-62	98-9F
		Macro 20	160-167	63-65	A0-A7
		Macro 21	168-175	66-68	A8-AF
		Macro 22	176-183	69-71	B0-B7
		Macro 23	184-191	72-74	B8-BF
		Macro 24	192-199	75-77	C0-C7
		Macro 25	200-207	78-80	C8-CF
		Macro 26	208-215	81-84	DD-D4
		Variable speed random	216-247	85-96	D5-F7
		No macro	248-255	97-100	F8-FF
<b>24</b>	<b>Control</b>	<b>Selections</b>			
		Safe	0-9	0-3	0-9
		Disable MSpeed for P/T	10-19	4-7	0A-13
		Display off	20-28	8-11	14-1C
		Display dim	30-38	12-14	1E-26
		Display bright	40-48	15-18	28-30
		Home	60-68	23-26	3C-44
		Lamp on	80-88	31-34	50-58
		Lamp off	90-98	35-38	5A-62
		Shutdown	120-130	46-50	78-82
		Reserved	131-255	51-100	83-FF



# Studio Spot CMY DMX Protocol Chart

DMX	Function	Description	Decimal	Percent	Hex
<b>1</b>	<b>Pan MSB</b>	Coarse Positioning, 8 bit	0-255	0-100	0-FF
<b>2</b>	<b>Pan LSB</b>	Fine Positioning	0-255	0-100	0-FF
<b>3</b>	<b>Tilt MSB</b>	Coarse Positioning, 8 bit	0-255	0-100	0-FF
<b>4</b>	<b>Tilt LSB</b>	Fine Positioning	0-255	0-100	0-FF
<b>5</b>	<b>Color Wheel 1 Function</b>	<b>Full Speeds</b>			
		Continuous	0-31	0-12	0-1F
		<i>Reserved</i>	32-47	13-18	2D-2F
		<i>Reserved</i>	48-63	16-24	30-3F
		<i>Reserved</i>	64-79	25-30	40-4F
		<i>Reserved</i>	80-87	31-33	50-57
		<i>Reserved</i>	88-95	34-37	58-5F
		<i>Reserved</i>	96-111	37-43	60-6F
		<i>Reserved</i>	112-127	44-49	70-7F
		<b>MSpeed Controlled</b>			
		Continuous	128-159	50-62	80-9F
		<i>Reserved</i>	160-175	63-68	A0-AF
		<i>Reserved</i>	176-191	69-74	B0-BF
		<i>Reserved</i>	192-207	75-80	C0-CF
		<i>Reserved</i>	208-215	81-83	D0-D7
		<i>Reserved</i>	216-223	84-87	D8-DF
		<i>Reserved</i>	224-239	88-93	E0-EF
		<i>Reserved</i>	240-255	94-100	F0-FF
<b>6</b>	<b>Cyan</b>	<b>Variable Saturation</b>			
		Full Saturation	0	0	0
		Open (No Saturation)	255	100	FF
<b>7</b>	<b>Magenta</b>	<b>Variable Saturation</b>			
		Full Saturation	0	0	0
		Open (No Saturation)	255	100	FF
<b>8</b>	<b>Yellow</b>	<b>Variable Saturation</b>			
		Full Saturation	0	0	0
		Open (No Saturation)	255	100	FF
<b>9</b>	<b>Litho Wheel 1 Function</b>	<b>Full Speed</b>			



		Indexed	0-15	0-5	0-0F
		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Wheel spin	48-63	19-24	30-3F
		Fast scan-indexed	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		Blink wheel	96-111	38-42	60-6F
		Blink aperture	112-127	43-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-143	50-55	80-8F
		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Wheel spin	176-191	69-74	B0-BF
		Fast Scan-indexed	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		Blink wheel	224-239	88-93	E0-EF
		Blink aperture	240-255	94-100	F0-FF
<b>10</b>	<b>Litho Wheel 1 Position</b>	<b>Indexed Positions</b>			
		Position 0	0-36	0-14	0-24
		Position 1	37-73	15-28	25-49
		Position 2	74-109	29-42	4A-6D
		Position 3	110-146	43-57	6E-92
		Position 4	147-182	58-71	93-B6
		Position 5	183-219	72-85	B7-D8
		Position 0	220-255	86-100	D9-FF
<b>11</b>	<b>Litho Wheel 1 Rotation</b>	<b>Indexed mode</b>			
		Indexable Positions	0-255	0-100	0-FF
	High Byte	<b>Variable forward spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	225	100	FF
		<b>Variable reverse spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	225	100	FF
		<b>Continuously variable spin mode</b>			
		Fastest forward spin	0	0	0
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		<b>Scan mode</b>			
		Scan slowest	0	0	0
		Scan fastest	255	100	FF
		<b>Random Mode</b>			
		Spin stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
<b>12</b>	<b>Litho Wheel 1 Rotation</b>	<b>Indexed Mode</b>			
		Fine Adjust (16-bit)	0-255	0-100	0-FF
<b>13</b>	<b>Litho Wheel 2 Function</b>	<b>Full Speed</b>			

	<b>Function</b>				
		Indexed	0-15	0-5	0-0F
		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Wheel spin	48-63	19-24	30-3F
		Fast scan-indexed	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		Blink wheel	96-111	38-42	60-6F
		Blink aperture	112-127	43-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-143	50-55	80-8F
		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Wheel spin	176-191	69-74	B0-BF
		Fast Scan-indexed	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		Blink wheel	224-239	88-93	E0-EF
		Blink aperture	240-255	94-100	F0-FF
<b>14</b>	<b>Litho Wheel 2 Position</b>	<b>Indexed Positions</b>			
		Position 0	0-36	0-14	0-24
		Position 1	37-73	15-28	25-49
		Position 2	74-109	29-42	4A-6D
		Position 3	110-146	43-57	6E-92
		Position 4	147-182	58-71	93-B6
		Position 5	183-219	72-85	B7-D8
		Position 0	220-255	86-100	D9-FF
<b>15</b>	<b>Litho Wheel 2 Rotation</b>	<b>Indexed mode</b>			
	High Byte	Indexable Positions	0-255	0-100	0-FF
		<b>Variable forward spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	225	100	FF
		<b>Variable reverse spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	225	100	FF
		<b>Continuously variable spin mode</b>			
		Fastest forward spin	0	0	0
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		<b>Scan mode</b>			
		Scan slowest	0	0	0
		Scan fastest	255	100	FF
		<b>Random Mode</b>			
		Spin stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
<b>16</b>	<b>Litho Wheel 2 Rotation</b>	<b>Indexed Mode</b>			
	Low Byte	Fine Adjust (16-bit)	0-255	0-100	0-FF
<b>17</b>	<b>Frost</b>	<b>Variable Frost</b>			

		No frost	0	0	0
		Variable	1-126	1-48	1-7E
		Full Frost	127	49	7F
		<b>Frost Effects (Variable Ranges)</b>			
		Slow frost strobe	128-143	50-55	80-8F
		Fast frost strobe	144-159	56-62	90-9F
		Ramp open/ snap shut	160-175	63-68	A0-AF
		Snap open/ ramp shut	176-191	69-74	B0-BF
		Random ramp/ snap	192-207	75-80	C0-CF
		Random snap/ ramp	208-223	81-87	D0-DF
		Open	224-255	88-100	E0-FF
<b>18</b>	<b>Focus</b>	<b>Variable Focus</b>			
		Focus image closer	0	0	0
		Focus image farther	256	100	FF
<b>19</b>	<b>Iris</b>	<b>Variable Iris</b>			
		Closed	0	0	0
		Variable	1-127	1-49	1-7F
		Open	128-143	50-55	80-8F
		<b>Iris Effects (Variable Ranges)</b>			
		Periodic strobe	144-159	56-62	90-9F
		Random strobe	160-175	63-68	A0-AF
		Ramp open/ snap shut	176-191	69-74	B0-BE
		Snap open/ ramp shut	192-207	75-80	BF-CF
		Random ramp/ snap	208-223	81-87	DD-DC
		Random snap/ ramp	224-239	88-93	E0-EF
		Open	240-255	94-100	F0-FF
<b>20</b>	<b>Shutter</b>	<b>Normal</b>			
		Closed	0-31	0-12	0-1F
		Open	224-255	88-100	E0-FF
		<b>Strobe Effects</b>			
		Variable speed	32-63	13-24	20-3F
		Random	64-95	25-37	40-5F
		Ramp open/ snap shut	96-127	38-49	60-7F
		Snap open/ ramp shut	128-159	50-62	80-9F
		Random ramp/ snap	160-191	63-74	A0-BF
		Random snap/ ramp	192-223	75-87	C0-DF
<b>21</b>	<b>Dimmer</b>	<b>Variable Range</b>			
		Open	0	0	0
		Closed	255	100	FF
<b>22</b>	<b>MSpeed</b>	<b>Ranges</b>			
		Controller crossfade	0-3	0-1	0-3
		Longest (252.7 sec.)	4	2	4
		Shortest (0.15 sec.)	255	100	FF
<b>23</b>	<b>Macros</b>	<b>Selections</b>			
		No macro	0-7	0-2	0-7
		Macro 1	8-15	3-5	8-0F



		Macro 2	16-23	6-9	10-17
		Macro 3	24-31	10-12	18-1F
		Macro 4	32-39	13-15	20-27
		Macro 5	40-47	16-18	28-2F
		Macro 6	48-55	19-21	30-37
		Macro 7	56-63	22-24	38-3F
		Macro 8	64-71	25-27	40-47
		Macro 9	72-79	28-30	48-4F
		Macro 10	80-87	31-34	50-57
		Macro 11	88-95	35-37	58-5F
		Macro 12	96-103	38-40	60-67
		Macro 13	104-111	41-43	68-6F
		Macro 14	112-119	44-46	70-77
		Macro 15	120-127	47-49	78-7F
		Macro 16	128-135	50-52	80-87
		Macro 17	136-143	53-55	88-8F
		Macro 18	144-151	56-59	90-97
		Macro 19	152-159	60-62	98-9F
		Macro 20	160-167	63-65	A0-A7
		Macro 21	168-175	66-68	A8-AF
		Macro 22	176-183	69-71	B0-B7
		Macro 23	184-191	72-74	B8-BF
		Macro 24	192-199	75-77	C0-C7
		Macro 25	200-207	78-80	C8-CF
		Macro 26	208-215	81-84	DD-D4
		Variable speed random	216-247	85-96	D5-F7
		No macro	248-255	97-100	F8-FF
<b>24</b>	<b>Control</b>	<b>Selections</b>			
		Safe	0-9	0-3	0-9
		Disable MSPEED for P/T	10-19	4-7	0A-13
		Display off	20-28	8-11	14-1C
		Display dim	30-38	12-14	1E-26
		Display bright	40-48	15-18	28-30
		Home	60-68	23-26	3C-44
		Lamp on	80-88	31-34	50-58
		Lamp off	90-98	35-38	5A-62
		Shutdown	120-130	46-50	78-82
		Reserved	131-255	51-100	83-FF



# ES-1

## DMX Protocol Chart

DMX	Function	Description	Decimal	Percent	Hex
1	Color Wheel 1 Function	<b>Full Speeds</b>			
		Indexed	0-31	0-12	0-1F
		Forward spin	32-47	13-18	2D-2F
		Reverse spin	48-63	16-24	30-3F
		Continuous	64-79	25-30	40-4F
		Fast scan	80-87	31-33	50-57
		Slow scan	88-95	34-37	58-5F
		Random	96-111	37-43	60-6F
		Blink-indexed	112-127	44-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-159	50-62	80-9F
		Forward Spin	160-175	63-68	A0-AF
		Reverse Spin	176-191	69-74	B0-BF
		Continuous	192-207	75-80	C0-CF
		Fast scan	208-215	81-83	D0-D7
		Slow scan	216-223	84-87	D8-DF
		Random	224-239	88-93	E0-EF
		Blink-indexed	240-255	94-100	F0-FF
2	Color Wheel 1 Position	<b>Indexed Mode</b>			
		Color 1	0-19	0-7	0-13
		Color 1 and 2	20-39	8-15	14-27
		Color 2	40-59	16-23	28-3B
		Color 2 and 3	60-78	24-30	3C-4E
		Color 3	79-98	31-38	4F-62
		Color 3 and 4	99-118	39-46	63-76
		Color 4	119-137	47-53	77-89
		Color 4 and 5	138-157	54-61	8A-9D
		Color 5	158-177	62-69	9E-B1
		Color 5 and 6	178-196	70-76	B2-C4
		Color 6	197-216	77-84	C5-D8
		Color 6 and 1	217-236	85-92	D9-EC
		Color 1	237-255	93-100	ED-FF
		<b>Continuous Mode</b>			
		Color 1	0	0	0
		Color 2	39	15	27

		Color 3	88	35	58
		Color 4	134	52	86
		Color 5	169	66	A9
		Color 6	213	83	D5
		Color 1	255	100	FF
		<b>Continuously Variable Forward Spin Mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	255	100	FF
		<b>Continuously Variable Reverse Spin Mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	255	100	FF
		<b>Random Mode</b>			
		Random stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
<b>3</b>	<b>Combined Modes</b>	<b>Combined Wheel Operation Mode</b>			
		Color 1	0-6	0-2	0-6
		Color 2	7-13	3-5	7-0D
		Color 3	14-20	6-7	0E-14
		Color 4	21-27	8-10	15-1B
		Color 5	28-34	11-13	1C-22
		Color 6	35-41	14-16	23-29
		Color 7	42-47	17-18	2A-2F
		Color 8	48-54	19-21	30-36
		Color 9	55-61	22-23	37-3D
		Color 10	62-68	24-26	3E-44
		Color 11	69-75	27-29	45-4B
		Color 12	76-82	30-32	4C-52
		Color 13	83-89	33-34	53-59
		Color 14	90-96	35-37	5A-60
		Color 15	97-103	38-40	61-67
		Color 16	104-110	41-42	68-6E
		Color 17	111-117	43-45	6F-75
		Color 18	118-124	46-48	76-7C
		Color 19	125-130	49-50	7D-82
		Color 20	131-137	51-53	83-89
		Color 21	138-144	54-56	8A-90
		Color 22	145-151	57-58	91-97
		Color 23	152-158	59-61	98-9E
		Color 24	159-165	61-64	9F-A5
		Color 25	166-172	65-67	A6-AC
		Color 26	173-179	68-69	AD-B3
		Color 27	180-186	70-72	B4-BA
		Color 28	187-193	73-75	BB-C1
		Color 29	194-200	76-78	C2-C8
		Color 30	201-207	79-80	C9-CF
		Color 31	208-213	81-83	D0-D2
		Color 32	214-220	84-85	D3-D9
		Color 33	221-227	86-88	DA-E3
		Color 34	228-234	89-91	E4-EA
		Color 35	235-241	92-94	EB-F1



	Note: Combined mode is set on the Function Channel on the second color wheel.	Color 36	242-248	95-96	F2-F8
		Color 1	249-255	97-100	F9-FF
		<b>Continuously Variable, 360° Mode</b>			
		Color 1	0	0	0
		Color 2	7	3	7
		Color 3	14	6	0E
		Color 4	21	8	15
		Color 5	28	11	1C
		Color 6	35	14	23
		Color 7	42	17	2A
		Color 8	49	19	31
		Color 9	56	21	38
		Color 10	63	24	3F
		Color 11	70	27	46
		Color 12	77	30	4D
		Color 13	84	32	54
		Color 14	91	35	5B
		Color 15	98	38	62
		Color 16	105	41	69
		Color 17	112	43	70
		Color 18	119	46	77
		Color 19	126	49	7E
		Color 20	133	51	85
		Color 21	140	54	8C
		Color 22	147	57	93
		Color 23	154	60	9A
		Color 24	161	62	A1
		Color 25	168	65	A8
		Color 26	175	68	AE
		Color 27	182	71	B6
		Color 28	189	73	BD
		Color 29	196	76	C4
		Color 30	203	79	CB
		Color 31	210	82	DF
		Color 32	217	84	D6
		Color 33	224	87	E0
		Color 34	231	90	E7
		Color 35	238	92	EE
		Color 36	245	95	F5
		Color 1	252	98	FC
<b>4</b>	<b>Color Wheel 2 Function</b>	<b>Full Speeds</b>			
		Combined Operation	0-15	0-5	0-F
		Indexed	16-31	6-12	10-1F
		Forward spin	32-47	13-18	2D-2F
		Reverse spin	48-63	16-24	30-3F
		Continuous	64-79	25-30	40-4F
		Fast scan	80-87	31-33	50-57
		Slow scan	88-95	34-37	58-5F
		Random	96-111	37-43	60-6F
		Blink-indexed	112-127	44-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-159	50-62	80-9F
		Forward Spin	160-175	63-68	A0-AF

		Forward Spin	176-191	69-74	B0-BF
		Reverse Spin	176-191	69-74	B0-BF
		Continuous	192-207	75-80	C0-CF
		Fast scan	208-215	81-83	D0-D7
		Slow scan	216-223	84-87	D8-DF
		Random	224-239	88-93	E0-EF
		Blink-indexed	240-255	94-100	F0-FF
<b>5</b>	<b>Color Wheel 2 Position</b>	<b>Indexed Mode</b>			
		Color 1	0-19	0-7	0-13
		Color 1 and 2	20-39	8-15	14-27
		Color 2	40-59	16-23	28-3B
		Color 2 and 3	60-78	24-30	3C-4E
		Color 3	79-98	31-38	4F-62
		Color 3 and 4	99-118	39-46	63-76
		Color 4	119-137	47-53	77-89
		Color 4 and 5	138-157	54-61	8A-9D
		Color 5	158-177	62-69	9E-B1
		Color 5 and 6	178-196	70-76	B2-C4
		Color 6	197-216	77-84	C5-D8
		Color 6 and 1	217-236	85-92	D9-EC
		Color 1	237-255	93-100	ED-FF
		<b>Continuous Mode</b>			
		Color 1	0	0	0
		Color 2	39	15	27
		Color 3	88	35	58
		Color 4	134	52	86
		Color 5	169	66	A9
		Color 6	213	83	D5
		Color 1	255	100	FF
		<b>Continuously Variable Forward Spin Mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	255	100	FF
		<b>Continuously Variable Reverse Spin Mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	255	100	FF
		<b>Random Mode</b>			
		Random stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
<b>6</b>	<b>Litho Wheel 1 Function</b>	<b>Full Speed</b>			
		Indexed	0-15	0-5	0-0F
		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Wheel spin	48-63	19-24	30-3F
		Fast scan-indexed	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		Blink wheel	96-111	38-42	60-6F
		Blink aperture	112-127	43-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-143	50-55	80-8F

		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Wheel spin	176-191	69-74	B0-BF
		Fast Scan-indexed	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		Blink wheel	224-239	88-93	E0-EF
		Blink aperture	240-255	94-100	F0-FF
<b>7</b>	<b>Litho Wheel 1 Position</b>	<b>Indexed Positions</b>			
		Position 0	0-36	0-14	0-24
		Position 1	37-73	15-28	25-49
		Position 2	74-109	29-42	4A-6D
		Position 3	110-146	43-57	6E-92
		Position 4	147-182	58-71	93-B6
		Position 5	183-219	72-85	B7-D8
		Position 0	220-255	86-100	D9-FF
<b>8</b>	<b>Litho Wheel 1 Rotation</b>	<b>Indexed mode</b>			
	High Byte	Indexable Positions	0-255	0-100	0-FF
		<b>Variable forward spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	225	100	FF
		<b>Variable reverse spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	225	100	FF
		<b>Continuously variable spin mode</b>			
		Fastest forward spin	0	0	0
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		<b>Scan mode</b>			
		Scan slowest	0	0	0
		Scan fastest	255	100	FF
		<b>Random Mode</b>			
		Spin stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
<b>9</b>	<b>Litho Wheel 1 Rotation</b>	<b>Indexed Mode</b>			
	Low Byte	Fine Adjust (16-bit)	0-255	0-100	0-FF
<b>10</b>	<b>Litho Wheel 2 Function</b>	<b>Full Speed</b>			
		Indexed	0-15	0-5	0-0F
		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Wheel spin	48-63	19-24	30-3F
		Fast scan-indexed	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		Blink wheel	96-111	38-42	60-6F
		Blink aperture	112-127	43-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-143	50-55	80-8F



		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Wheel spin	176-191	69-74	B0-BF
		Fast Scan-indexed	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		Blink wheel	224-239	88-93	E0-EF
		Blink aperture	240-255	94-100	F0-FF
<b>11</b>	<b>Litho Wheel 2 Position</b>	<b>Indexed Positions</b>			
		Position 0	0-36	0-14	0-24
		Position 1	37-73	15-28	25-49
		Position 2	74-109	29-42	4A-6D
		Position 3	110-146	43-57	6E-92
		Position 4	147-182	58-71	93-B6
		Position 5	183-219	72-85	B7-D8
		Position 0	220-255	86-100	D9-FF
<b>12</b>	<b>Litho Wheel 2 Rotation</b>	<b>Indexed mode</b>			
	High Byte	Indexable Positions	0-255	0-100	0-FF
		<b>Variable forward spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	225	100	FF
		<b>Variable reverse spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	225	100	FF
		<b>Continuously variable spin mode</b>			
		Fastest forward spin	0	0	0
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		<b>Scan mode</b>			
		Scan slowest	0	0	0
		Scan fastest	255	100	FF
		<b>Random Mode</b>			
		Spin stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
<b>13</b>	<b>Litho Wheel 2 Rotation</b>	<b>Indexed Mode</b>			
	Low Byte	Fine Adjust (16-bit)	0-255	0-100	0-FF
<b>14</b>	<b>Frost</b>	<b>Variable Frost</b>			
		No frost	0	0	0
		Variable	1-126	1-48	1-7E
		Full Frost	127	49	7F
		<b>Frost Effects (Variable Ranges)</b>			
		Slow frost strobe	128-143	50-55	80-8F
		Fast frost strobe	144-159	56-62	90-9F
		Ramp open/ snap shut	160-175	63-68	A0-AF
		Snap open/ ramp shut	176-191	69-74	B0-BF

		Random ramp/ snap	192-207	75-80	C0-CF
		Random snap/ ramp	208-223	81-87	D0-DF
		Open	224-255	88-100	E0-FF
<b>15</b>	<b>Focus</b>	<b>Variable Focus</b>			
		Focus image closer	0	0	0
		Focus image farther	256	100	FF
<b>16</b>	<b>Iris</b>	<b>Variable Iris</b>			
		Closed	0	0	0
		Variable	1-127	1-49	1-7F
		Open	128-143	50-55	80-8F
		<b>Iris Effects (Variable Ranges)</b>			
		Periodic strobe	144-159	56-62	90-9F
		Random strobe	160-175	63-68	A0-AF
		Ramp open/ snap shut	176-191	69-74	B0-BE
		Snap open/ ramp shut	192-207	75-80	BF-CF
		Random ramp/ snap	208-223	81-87	DD-DC
		Random snap/ ramp	224-239	88-93	E0-EF
		Open	240-255	94-100	F0-FF
<b>17</b>	<b>Shutter</b>	<b>Normal</b>			
		Closed	0-31	0-12	0-1F
		Open	224-255	88-100	E0-FF
		<b>Strobe Effects</b>			
		Variable speed	32-63	13-24	20-3F
		Random	64-95	25-37	40-5F
		Ramp open/ snap shut	96-127	38-49	60-7F
		Snap open/ ramp shut	128-159	50-62	80-9F
		Random ramp/ snap	160-191	63-74	A0-BF
		Random snap/ ramp	192-223	75-87	C0-DF
<b>18</b>	<b>Dimmer</b>	<b>Variable Range</b>			
		Open	0	0	0
		Closed	255	100	FF
<b>19</b>	<b>MSpeed</b>	<b>Ranges</b>			
		Controller crossfade	0-3	0-1	0-3
		Longest (252.7 sec.)	4	2	4
		Shortest (0.15 sec.)	255	100	FF
<b>20</b>	<b>Macros</b>	<b>Selections</b>			
		No macro	0-7	0-2	0-7
		Macro 1	8-15	3-5	8-0F
		Macro 2	16-23	6-9	10-17
		Macro 3	24-31	10-12	18-1F
		Macro 4	32-39	13-15	20-27
		Macro 5	40-47	16-18	28-2F
		Macro 6	48-55	19-21	30-37
		Macro 7	56-63	22-24	38-3F
		Macro 8	64-71	25-27	40-47
		Macro 9	72-79	28-30	48-4F
		Macro 10	80-87	31-34	50-57
		Macro 11	88-95	35-37	58-5F

		Macro 12	96-103	38-40	60-67
		Macro 13	104-111	41-43	68-6F
		Macro 14	112-119	44-46	70-77
		Macro 15	120-127	47-49	78-7F
		Macro 16	128-135	50-52	80-87
		Macro 17	136-143	53-55	88-8F
		Macro 18	144-151	56-59	90-97
		Macro 19	152-159	60-62	98-9F
		Macro 20	160-167	63-65	A0-A7
		Macro 21	168-175	66-68	A8-AF
		Macro 22	176-183	69-71	B0-B7
		Macro 23	184-191	72-74	B8-BF
		Macro 24	192-199	75-77	C0-C7
		Macro 25	200-207	78-80	C8-CF
		Macro 26	208-215	81-84	DD-D4
		Variable speed random	216-247	85-96	D5-F7
		No macro	248-255	97-100	F8-FF
<b>21</b>	<b>Control</b>	<b>Selections</b>			
		Safe	0-9	0-3	0-9
		Disable MSpeed for P/T	10-19	4-7	0A-13
		Display off	20-28	8-11	14-1C
		Display dim	30-38	12-14	1E-26
		Display bright	40-48	15-18	28-30
		Home	60-68	23-26	3C-44
		Lamp on	80-88	31-34	50-58
		Lamp off	90-98	35-38	5A-62
		Shutdown	120-130	46-50	78-82
		Reserved	131-255	51-100	83-FF

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## Studio Spot 250 DMX Protocol Chart

DMX	Function	Description	Decimal	Percent	Hex
1	Pan	Pan Coarse	0 - 255	0-100	0-FF
2	Pan	Pan Fine	0 - 255	0-100	0-FF
3	Tilt	Tilt Coarse	0 - 255	0-100	0-FF
4	Tilt	Tilt Fine	0 - 255	0-100	0-FF
5	Color Function	<b>Full Speed</b>			
		Indexed	0 - 15	0-6	0-0F
		Forward Spin	16-31	6-12	10-1F
		Reverse Spin	32-47	13-18	20-2F
		Continuous	48-63	19-25	30-3F
		Slow Scan	64-79	25-31	40-4F
		Fast Scan	80-95	31-37	50-5F
		Random	96-111	38-44	60-6F
		Blink-Indexed	112-127	44-50	70-7F
		<b>MSpeed Control</b>			
		Indexed	128-143	50-56	80-8F
		Forward Spin	144-159	57-62	90-9F
		Reverse Spin	160-175	63-69	A0-AF
		Continuous	176-191	69-75	B0-BF
		Slow Scan	192-207	75-81	C0-CF
		Fast Scan	208-223	82-88	D0-DF
		Random	224-239	88-94	E0-EF
		Blink-Indexed	240-255	94-100	F0-FF
6	Color Wheel Position	<b>Indexed Mode</b>			
		Color 1	0-23	0-9	0-17
		Color 2	24-31	9-12	18-1F
		Color 3	32-39	13-15	20-27
		Color 4	40-47	16-18	28-2F
		Color 5	48-55	19-22	30-37
		Color 6	56-63	22-25	38-3F
		Color 7	64-71	25-28	40-47
		Color 8	72-79	28-31	48-4F
		Color 9	80-87	31-34	50-57

7	Litho Wheel 1	Color 10	88-95	35-37	58-5F
		Color 11	96-103	38-40	60-67
		Color 12	104-111	41-44	68-6F
		Color 13	112-127	44-50	70-7F
		Color 1/2	128-143	50-56	80-8F
		Color 2/3	144-151	57-59	90-97
		Color 3/4	152-159	60-62	98-9F
		Color 4/5	160-167	63-66	A0-A7
		Color 5/6	168-175	66-69	A8-AF
		Color 6/7	176-183	69-72	B0-B7
		Color 7/8	184-191	72-75	B8-BF
		Color 8/9	192-199	75-78	C0-C7
		Color 9/10	200-207	78-81	C8-CF
		Color 10/11	208-215	82-84	D0-D7
		Color 11/12	216-223	85-88	D8-DF
		Color 12/13	224-231	88-91	E0-E7
		Color 13/1	232-247	91-97	E8-F7
		Color 1	248-255	97-100	F8-FF
		<b>Continuously Variable Mode</b>			
		Color 1	0	0	0
		Color 2	19	8	13
		Color 3	39	15	27
		Color 4	58	23	3A
		Color 5	78	31	4E
		Color 6	98	38	62
		Color 7	117	46	75
		Color 8	137	54	89
		Color 9	156	61	9C
		Color 10	176	69	B0
		Color 11	196	77	C4
		Color 12	215	84	D7
		Color 13	235	92	EB
		Color 1	255	100	FF
		<b>Continuously Variable Forward Spin Mode</b>			
		Spin Stop	0-3	0-1	0-3
		Spin Forward Slowest	4	2	4
		Spin Forward Fastest	255	100	FF
		<b>Continuously Variable Reverse Spin Mode</b>			
		Spin Stop	0-3	0-1	0-3
		Spin Reverse Slowest	4	2	4
		Spin Reverse Fastest	255	100	FF
		<b>Random Mode</b>			
		Random Stop	0-3	0-1	0-3
		Random Slowest	4	2	4
		Random Fastest	255	100	FF
		<b>Full Speed</b>			

	Function				
		Indexed	0-15	0-5	0-0F
		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Wheel spin	48-63	19-24	30-3F
		Fast scan-indexed	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		Blink wheel	96-111	38-42	60-6F
		Blink aperture	112-127	43-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-143	50-55	80-8F
		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Wheel spin	176-191	69-74	B0-BF
		Fast Scan-indexed	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		Blink wheel	224-239	88-93	E0-EF
		Blink aperture	240-255	94-100	F0-FF
<b>8</b>	<b>Litho Wheel 1 Position</b>	<b>Indexed Positions</b>			
		Position 0	0-15	0-6	0-0F
		Position 1	16-47	6-18	10-2F
		Position 2	48-79	19-31	30-4F
		Position 3	80-111	31-44	50-6F
		Position 4	112-143	44-56	70-8F
		Position 5	144-175	57-69	90-AF
		Position 6	176-207	69-81	B0-CF
		Position 7	208-239	82-94	D0-EF
		Position 0	240-255	94-100	F0-FF
<b>9</b>	<b>Litho Wheel 1 Rotation</b>	<b>Indexed mode</b>			
		Indexable Positions	0-255	0-100	0-FF
		<b>Variable forward spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin forward slowest	4	2	4
		Spin forward fastest	225	100	FF
		<b>Variable reverse spin mode</b>			
		Spin stop	0-3	0-1	0-3
		Spin reverse slowest	4	2	4
		Spin reverse fastest	225	100	FF
		<b>Continuously variable spin mode</b>			
		Fastest forward spin	0	0	0
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		<b>Scan mode</b>			
		Scan slowest	n	n	n



		Scan slowest	255	100	FF
		Scan fastest	255	100	FF
		<b>Random Mode</b>			
		Spin stop	0-3	0-1	0-3
		Random slowest	4	2	4
		Random fastest	255	100	FF
<b>10</b>	<b>Effects Wheel</b>	<b>Full Speed</b>			
		Position 0	0-25	0-10	0-19
		Position 1	26-51	10-20	1A-33
		Position 2	52-76	20-30	34-4C
		Position 3	77-102	30-40	4D-66
		Position 4	103-127	40-50	67-7F
		<b>MSpeed Controlled</b>			
		Position 0	128-153	50-60	80-99
		Position 1	154-178	60-70	9A-B2
		Position 2	179-204	70-80	B3-CC
		Position 3	205-229	80-90	CD-E5
		Position 4	230-255	90-100	E6-FF
<b>11</b>	<b>Effects Rotate</b>	<b>Variable Ranges</b>			
		Fastest Reverse Rotate	0	0	0
		Slowest Reverse Rotate	120	47	78
		Rotate Stop	121-134	48-53	79-86
		Slowest Forward Rotate	135	53	87
		Fastest Forward Rotate	255	100	FF
<b>12</b>	<b>Focus</b>	<b>Variable Focus</b>			
		Focus image closer	0	0	0
		Focus image farther	255	100	FF
<b>13</b>	<b>Iris</b>	<b>Variable Iris</b>			
		Close	0	0	0
		Variable Iris	1-127	1-50	01-7F
		Open	128-135	50-53	80-87
		<b>Iris Effects (Variable Ranges)</b>			
		Periodic Strobe	136-151	53-59	88-97
		Random Strobe	152-167	60-66	98-A7
		Ramp Open/Snap Shut	168-183	66-72	A8-B7
		Snap Open/Ramp Shut	184-199	72-78	B8-C7
		Ramp Open/Ramp Shut	200-215	78-84	C8-D7
		Random Ramp/Snap	216-231	85-91	D8-E7
		Random Snap/Ramp	232-247	91-97	E8-F7
		Open	248-255	97-100	F8-FF
<b>14</b>	<b>Shutter</b>	<b>Normal</b>			

		Close	0-23	0-9	0-17
		Open	232-255	91-100	E8-FF
		<b>Strobe Effects (Variable Ranges)</b>			
		Periodic Strobe	24-49	9-19	18-31
		Random/Rand Strobe	50-75	20-29	32-4B
		Random/Sync	76-101	30-40	4C-65
		Ramp Open/Snap Shut	102-127	40-50	66-7F
		Snap Open/Ramp Shut	128-153	50-60	80-99
		Ramp Open/Ramp Shut	154-179	60-70	9A-B3
		Random Ramp/Snap	180-205	71-80	B4-CD
		Random Snap/Ramp	206-231	81-91	CE-E7
<b>15</b>	<b>Dimmer</b>	<b>Variable Range</b>			
		Closed	0	0	0
		Open	255	100	FF
<b>16</b>	<b>MSpeed</b>	<b>Ranges</b>			
		Controller crossfade	0-3	0-1	0-3
		Longest (252.7 sec.)	4	2	4
		Shortest (0.15 sec.)	255	100	FF
<b>17</b>	<b>Macros / LAD</b>	<b>Selections</b>			
		No Macro / LAD off	0-7	0-3	0-07
		Macro 1	8-11	3-4	08-0B
		Macro 2	12-15	5-6	0C-0F
		Macro 3	16-19	6-8	10-13
		Macro 4	20-23	8-9	14-17
		Macro 5	24-27	9-11	18-1B
		Macro 6	28-31	11-12	1C-1F
		Macro 7	32-35	13-14	20-23
		Macro 8	36-39	14-15	24-27
		Macro 9	40-43	16-17	28-2B
		Macro 10	44-47	17-18	2C-2F
		Macro 11	48-51	19-20	30-33
		Macro 12	52-55	20-22	34-37
		Macro 13	56-59	22-23	38-3B
		Macro 14	60-63	24-25	3C-3F
		Macro 15	64-67	25-26	40-43
		Macro 16	68-71	27-28	44-47
		Macro 17	72-75	28-29	48-4B
		Macro 18	76-79	30-31	4C-4F
		Macro 19	80-83	31-33	50-53
		Macro 20	84-87	33-34	54-57
		Macro 21	88-91	35-36	58-5B
		Macro 22	92-95	36-37	5C-5F
		Macro 23	96-99	38-39	60-63
		Macro 24	100-103	39-40	64-67

		Macro 25	104-107	41-42	68-6B
		Macro 26	108-111	42-44	6C-6F
		Macro 27	112-115	44-45	70-73
		Macro 28	116-119	46-47	74-77
		Macro 29	120-123	47-48	78-7B
		Macro 30	124-127	49-50	7C-7F
		Macro 31	128-131	50-51	80-83
		Macro 32	132-135	52-53	84-87
		Random Macros (Variable)	136-167	53-66	88-A7
		LAD Off / No Macros	168-199	66-78	A8-C7
		LAD Modulate (Variable)	200-231	78-91	C8-E7
		LAD On	232-255	91-100	E8-FF
<b>18</b>	<b>Control</b>	<b>Selections</b>			
	After choosing a control channel value, set the Shutter channel to "O" to access the Control channel settings  Send "Shutdown" value for approximately two seconds	Safe (normal operation)	0-9	0-3	0-9
		Disable MSpeed for P/T	10-19	4-7	0A-13
		Display off	20-28	8-11	14-1C
		Display dim	30-38	12-14	1E-26
		Display bright	40-48	15-18	28-30
		Home	60-68	23-26	3C-44
		Lamp on	80-88	31-34	50-58
		Lamp off	90-98	35-38	5A-62
		Shutdown	120-130	46-50	78-82
		Reserved	131-255	51-100	83-FF





# Studio Color 250

## DMX Protocol Chart

DMX	Function	Description	Decimal	Percent	Hex
<b>1</b>	<b>Pan</b>	<b>Pan Coarse</b>	0 - 255	0-100	0-FF
<b>2</b>	<b>Pan</b>	<b>Pan Fine</b>	0 - 255	0-100	0-FF
<b>3</b>	<b>Tilt</b>	<b>Tilt Coarse</b>	0 - 255	0-100	0-FF
<b>4</b>	<b>Tilt</b>	<b>Tilt Fine</b>	0 - 255	0-100	0-FF
<b>5</b>	<b>Color Function</b>	<b>Full Speed</b>			
		Continuous	0 - 15	0-6	0-0F
		Indexed	16-31	6-12	10-1F
		Pure Mix	32-47	13-18	20-2F
		Spin	48-63	19-25	30-3F
		Cycle	64-79	25-31	40-4F
		Not Assigned - TBD	80-95	31-37	50-5F
		Random	96-111	38-44	60-6F
		Blink-Indexed	112-127	44-50	70-7F
		<b>MSpeed Controlled</b>			
		Continuous	128-143	50-56	80-8F
		Indexed	144-159	57-62	90-9F
		Pure Mix	160-175	63-69	A0-AF
		Spin	176-191	69-75	B0-BF
		Cycle	192-207	75-81	C0-CF
		Not Assigned - TBD	208-223	82-88	D0-DF
		Random	224-239	88-94	E0-EF
		Blink-Indexed	240-255	94-100	F0-FF
<b>6</b>	<b>Cyan Color Wheel</b>	<b>Continuous Mode</b>			
		Open	0	0	0
		Color 1	42	17	2A
		Color 2	85	33	55
		Cyan In (Full saturation)	127	50	7F
		Cyan Out (Low saturation)	255	100	FF
		<b>Indexed Mode</b>			
		Open	0-15	0-6	0-0F
		Color 1	16-47	6-18	10-2F

		Color 2	48-79	19-31	30-4F
		Cyan Full Saturation	80-111	31-44	50-6F
		Cyan Med. High Saturation	112-143	44-56	70-8F
		Cyan Medium Saturation	144-175	57-69	90-AF
		Cyan Med. Low Saturation	176-207	69-81	B0-CF
		Cyan Low Saturation	208-239	82-94	D0-EF
		Open	240-255	94-100	F0-FF
		<b>Pure Mix Mode</b>			
		Cyan In (Full saturation)	0	0	0
		Cyan Out (Low saturation)	255	100	FF
		<b>Spin Mode</b>			
		Continuous Positioning	0-127	0-50	0-7F
		Spin Reverse Fastest	128-157	50-62	80-9D
		Spin Reverse Slowest	158-187	62-73	9E-BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward Slowest	196-225	77-88	C4-E1
		Spin Forward Fastest	226-255	89-100	E2-FF
		<b>Cycle &amp; Random Modes</b>			
		Slow Rate	0	0	0
		Fast Rate	255	100	FF
7	Magenta Color Wheel	<b>Continuous Mode</b>			
		Open	0	0	0
		Color 1	42	17	2A
		Color 2	85	33	55
		Magenta In (Full saturation)	127	50	7F
		Magenta Out (Low saturation)	255	100	FF
		<b>Indexed Mode</b>			
		Open	0-15	0-6	0-0F
		Color 1	16-47	6-18	10-2F
		Color 2	48-79	19-31	30-4F
		Magenta Full Saturation	80-111	31-44	50-6F
		Magenta Med. High Saturation	112-143	44-56	70-8F
		Magenta Medium Saturation	144-175	57-69	90-AF
		Magenta Med. Low Saturation	176-207	69-81	B0-CF
		Magenta Low Saturation	208-239	82-94	D0-EF
		Open	240-255	94-100	F0-FF





		Spin Stop	188-195	74-77	BC-C3
		Spin Forward Slowest	196-225	77-88	C4-E1
		Spin Forward Fastest	226-255	89-100	E2-FF
<b>9</b>	<b>Beam Shaping</b>	<b>Variable Ranges</b>			
	(Lenticular Wheel)	Continuous Positioning	0-127	0-50	0-7F
		Spin Reverse Fastest	128-157	50-62	80-9D
		Spin Reverse Slowest	158-187	62-73	9E-BB
		Spin Stop	188-195	74-77	BC-C3
		Spin Forward Slowest	196-225	77-88	C4-E1
		Spin Forward Fastest	226-255	89-100	E2-FF
<b>10</b>	<b>Focus</b>	<b>Variable Focus</b>			
		Focus image closer	0	0	0
		Focus image farther	255	100	FF
<b>11</b>	<b>Shutter</b>	<b>Normal</b>			
		Close	0-23	0-9	0-17
		Open	232-255	91-100	E8-FF
		<b>Strobe Effects (Variable Ranges)</b>			
		Periodic Strobe	24-49	9-19	18-31
		Random/Rand Strobe	50-75	20-29	32-4B
		Random/Sync	76-101	30-40	4C-65
		Ramp Open/Snap Shut	102-127	40-50	66-7F
		Snap Open/Ramp Shut	128-153	50-60	80-99
		Ramp Open/Ramp Shut	154-179	60-70	9A-B3
		Random Ramp/Snap	180-205	71-80	B4-CD
		Random Snap/Ramp	206-231	81-91	CE-E7
<b>12</b>	<b>Dimmer</b>	<b>Variable Range</b>			
		Closed	0	0	0
		Open	255	100	FF
<b>13</b>	<b>MSpeed</b>	<b>Ranges</b>			
		Controller crossfade	0-3	0-1	0-3
		Longest (252.7 sec.)	4	2	4
		Shortest (0.15 sec.)	255	100	FF
<b>14</b>	<b>Macros</b>	<b>Selections</b>			
		No Macro / LAD off	0-7	0-3	0-07
		Macro 1	8-11	3-4	08-0B
		Macro 2	12-15	5-6	0C-0F
		Macro 3	16-19	6-8	10-13
		Macro 4	20-23	8-9	14-17

		Macro 5	24-27	9-11	18-1B
		Macro 6	28-31	11-12	1C-1F
		Macro 7	32-35	13-14	20-23
		Macro 8	36-39	14-15	24-27
		Macro 9	40-43	16-17	28-2B
		Macro 10	44-47	17-18	2C-2F
		Macro 11	48-51	19-20	30-33
		Macro 12	52-55	20-22	34-37
		Macro 13	56-59	22-23	38-3B
		Macro 14	60-63	24-25	3C-3F
		Macro 15	64-67	25-26	40-43
		Macro 16	68-71	27-28	44-47
		Macro 17	72-75	28-29	48-4B
		Macro 18	76-79	30-31	4C-4F
		Macro 19	80-83	31-33	50-53
		Macro 20	84-87	33-34	54-57
		Macro 21	88-91	35-36	58-5B
		Macro 22	92-95	36-37	5C-5F
		Macro 23	96-99	38-39	60-63
		Macro 24	100-103	39-40	64-67
		Macro 25	104-107	41-42	68-6B
		Macro 26	108-111	42-44	6C-6F
		Macro 27	112-115	44-45	70-73
		Macro 28	116-119	46-47	74-77
		Macro 29	120-123	47-48	78-7B
		Macro 30	124-127	49-50	7C-7F
		Macro 31	128-131	50-51	80-83
		Macro 32	132-135	52-53	84-87
		Random Macros (Variable)	136-167	53-66	88-A7
		LAD Off / No Macros	168-199	66-78	A8-C7
		LAD Modulate (Variable)	200-231	78-91	C8-E7
		LAD On	232-255	91-100	E8-FF
<b>15</b>	<b>Control</b>	<b>Selections</b>			
	After choosing a control channel value, set the Shutter channel to "O" to access the Control channel settings	Safe (normal operation)	0-9	0-3	0-9
		Disable MSpeed for P/T	10-19	4-7	0A-13
		Display off	20-28	8-11	14-1C
		Display dim	30-38	12-14	1E-26
		Display bright	40-48	15-18	28-30
		Home	60-68	23-26	3C-44
		Lamp on	80-88	31-34	50-58
	Send "Shutdown" value for approximately two seconds	Lamp off	90-98	35-38	5A-62
		Shutdown	120-130	46-50	78-82
		Reserved	131-255	51-100	83-FF



**Technobeam®**

## DMX Protocol Chart - 18 Channel Mode

DMX	Function	Description	Decimal	Percent	Hex
<b>1</b>	<b>Pan</b>	<b>Pan Coarse (High)</b>	0 - 255	0-100	00-FF
<b>2</b>	<b>Pan</b>	<b>Pan Fine (Low)</b>	0 - 255	0-100	00-FF
<b>3</b>	<b>Tilt</b>	<b>Tilt Coarse (High)</b>	0 - 255	0-100	00-FF
<b>4</b>	<b>Tilt</b>	<b>Tilt Fine (Low)</b>	0 - 255	0-100	00-FF
<b>5</b>	<b>Color Function</b>	<b>Full Speed</b>			
		Indexed	0 - 15	0-6	00-0F
		Forward Spin	16-31	6-12	10-1F
		Reverse Spin	32-47	13-18	20-2F
		Continuous	48-63	19-25	30-3F
		Slow Scan	64-79	25-31	40-4F
		Fast Scan	80-95	31-37	50-5F
		Random	96-111	38-44	60-6F
		Blink-Indexed	112-127	44-50	70-7F
		<b>MSpeed Control</b>			
		Indexed	128-143	50-56	80-8F
		Forward Spin	144-159	57-62	90-9F
		Reverse Spin	160-175	63-69	A0-AF
		Continuous	176-191	69-75	B0-BF
		Slow Scan	192-207	75-81	C0-CF
		Fast Scan	208-223	82-88	D0-DF
		Random	224-239	88-94	E0-EF
		Blink-Indexed	240-255	94-100	F0-FF
<b>6</b>	<b>Color Wheel Position</b>	<b>Indexed and Blink Modes</b>			
		Color 1	0-23	0-9	00-17
		Color 2	24-31	9-12	18-1F
		Color 3	32-39	13-15	20-27
		Color 4	40-47	16-18	28-2F
		Color 5	48-55	19-22	30-37
		Color 6	56-63	22-25	38-3F
		Color 7	64-71	25-28	40-47
		Color 8	72-79	28-31	48-4F
		Color 9	80-87	31-34	50-57



7	Litho Wheel Function **	Color 10	88-95	35-37	58-5F
		Color 11	96-103	38-40	60-67
		Color 12	104-111	41-44	68-6F
		Color 13	112-127	44-50	70-7F
		Color 1/2	128-143	50-56	80-8F
		Color 2/3	144-151	57-59	90-97
		Color 3/4	152-159	60-62	98-9F
		Color 4/5	160-167	63-66	A0-A7
		Color 5/6	168-175	66-69	A8-AF
		Color 6/7	176-183	69-72	B0-B7
		Color 7/8	184-191	72-75	B8-BF
		Color 8/9	192-199	75-78	C0-C7
		Color 9/10	200-207	78-81	C8-CF
		Color 10/11	208-215	82-84	D0-D7
		Color 11/12	216-223	85-88	D8-DF
		Color 12/13	224-231	88-91	E0-E7
		Color 13/1	232-247	91-97	E8-F7
		Color 1	248-255	97-100	F8-FF
		<b>Continuously Variable Mode</b>			
		Color 1	0	0	00
		Color 2	19	8	13
		Color 3	39	15	27
		Color 4	58	23	3A
		Color 5	78	31	4E
		Color 6	98	38	62
		Color 7	117	46	75
		Color 8	137	54	89
		Color 9	156	61	9C
		Color 10	176	69	B0
		Color 11	196	77	C4
		Color 12	215	84	D7
		Color 13	235	92	EB
		Color 1	255	100	FF
		<b>Continuously Variable Forward Spin Mode</b>			
		Spin Stop	0-3	0-1	00-03
		Spin Forward Slowest	4	2	04
		Spin Forward Fastest	255	100	FF
		<b>Continuously Variable Reverse Spin Mode</b>			
		Spin Stop	0-3	0-1	00-03
		Spin Reverse Slowest	4	2	04
		Spin Reverse Fastest	255	100	FF
		<b>Random Mode</b>			
		Random Stop	0-3	0-1	00-03
		Random Slowest	4	2	04
		Random Fastest	255	100	FF
		<b>Full Speed</b>			
		Indexed	0-15	0-5	00-0F

		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Scan	48-63	19-24	30-3F
		Blink	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		RFU (Default-Random)*	96-111	38-42	60-6F
		Wheel spin	112-127	43-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-143	50-55	80-8F
		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Scan	176-191	69-74	B0-BF
		Blink	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		RFU (Default-Random)*	224-239	88-93	E0-EF
		Wheel spin	240-255	94-100	F0-FF
<b>8</b>	<b>Litho Wheel Position</b>	<b>Indexed Positions</b>			
		Position 0 (Open)	0-15	0-6	00-0F
		Position 1	16-47	6-18	10-2F
		Position 2	48-79	19-31	30-4F
		Position 3	80-111	31-44	50-6F
		Position 4	112-143	44-56	70-8F
		Position 5	144-175	57-69	90-AF
		Position 6	176-207	69-81	B0-CF
		Position 7	208-239	82-94	D0-EF
		Position 0 (Open)	240-255	94-100	F0-FF
<b>9</b>	<b>Litho Wheel Rotation (H)</b>	<b>Indexed and Blink modes</b>			
	High Byte	Indexable Positions	0-255	0-100	0-FF
		<b>Variable forward spin mode</b>			
		Spin stop	0-3	0-1	00-03
		Spin forward slowest	4	2	04
		Spin forward fastest	225	100	FF
		<b>Variable reverse spin mode</b>			
		Spin stop	0-3	0-1	00-03
		Spin reverse slowest	4	2	04
		Spin reverse fastest	225	100	FF
		<b>Continuously variable spin mode</b>			
		Fastest forward spin	0	0	00
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		<b>Scan mode</b>			
		Scan slowest	0	0	00
		Scan fastest	255	100	FF
		<b>Random Mode (Pause Time)</b>			
		Spin stop	0-3	0-1	00-03

		Spin stop	00	01	00-00
		Random slowest	4	2	04
		Random fastest	255	100	FF
<b>10</b>	<b>Litho Wheel 1 Rotation</b>	<b>Indexed Mode</b>			
	Low Byte	Fine Adjust (16-bit)	0-255	0-100	0-FF
<b>11</b>	<b>Effects Wheel</b>	<b>Full Speed</b>			
		Position 0 (Open)	0-25	0-10	00-19
		Position 1	26-51	10-20	1A-33
		Position 2	52-76	20-30	34-4C
		Position 3	77-102	30-40	4D-66
		Position 4	103-127	40-50	67-7F
		<b>MSpeed Controlled</b>			
		Position 0 (Open)	128-153	50-60	80-99
		Position 1	154-178	60-70	9A-B2
		Position 2	179-204	70-80	B3-CC
		Position 3	205-229	80-90	CD-E5
		Position 4	230-255	90-100	E6-FF
<b>12</b>	<b>Effects Rotate</b>	<b>Variable Ranges</b>			
		Fastest Reverse Rotate	0	0	00
		Slowest Reverse Rotate	120	47	78
		Rotate Stop (Static)	121-134	48-53	79-86
		Slowest Forward Rotate	135	53	87
		Fastest Forward Rotate	255	100	FF
<b>13</b>	<b>Focus</b>	<b>Variable Focus</b>			
		Focus image closer	0	0	00
		Focus image farther	255	100	FF
<b>14</b>	<b>Shutter</b>	<b>Normal</b>			
		Close	0-7	0-2	00-07
		Open	248-255	97-100	F8-FF
		<b>Strobe Effects (Variable Ranges)</b>			
		Periodic Strobe	8-67	3-26	08-43
		Random Strobe	68-127	27-49	44-7F
		Ramp Open/Snap Shut	128-187	50-73	80-BB
		Snap Open/Ramp Shut	188-247	74-96	BC-F7
<b>15</b>	<b>Dimmer</b>	<b>Variable Range</b>			
		Closed	0	0	00
		Open	255	100	FF
<b>16</b>	<b>MSpeed</b>	<b>Ranges</b>			
		Controller crossfade	0-3	0-1	00-03
		Longest (252.7 sec.)	4	2	4
		Shortest (0.15 sec.)	255	100	FF
<b>17</b>	<b>Macros / LAD</b>	<b>Selections</b>			



		No Macro / LAD off	0-7	0-3	00-07
		Macro 1	8-11	3-4	08-0B
		Macro 2	12-15	5-6	0C-0F
		Macro 3	16-19	6-8	10-13
		Macro 4	20-23	8-9	14-17
		Macro 5	24-27	9-11	18-1B
		Macro 6	28-31	11-12	1C-1F
		Macro 7	32-35	13-14	20-23
		Macro 8	36-39	14-15	24-27
		Macro 9	40-43	16-17	28-2B
		Macro 10	44-47	17-18	2C-2F
		Macro 11	48-51	19-20	30-33
		Macro 12	52-55	20-22	34-37
		Macro 13	56-59	22-23	38-3B
		Macro 14	60-63	24-25	3C-3F
		Macro 15	64-67	25-26	40-43
		Macro 16	68-71	27-28	44-47
		Macro 17	72-75	28-29	48-4B
		Macro 18	76-79	30-31	4C-4F
		Macro 19	80-83	31-33	50-53
		Macro 20	84-87	33-34	54-57
		Macro 21	88-91	35-36	58-5B
		Macro 22	92-95	36-37	5C-5F
		Macro 23	96-99	38-39	60-63
		Macro 24	100-103	39-40	64-67
		Macro 25	104-107	41-42	68-6B
		Macro 26	108-111	42-44	6C-6F
		Macro 27	112-115	44-45	70-73
		Macro 28	116-119	46-47	74-77
		LAD Off / No Macros	120-127	48-50	78-7F
		LAD Modulate (Variable)	128-247	51-97	80-F7
		LAD On	248-255	98-100	F8-FF
<b>18</b>	<b>Control</b>	<b>Selections</b>			
	After choosing a control channel value, set the Shutter channel to "O" to access the Control channel settings	Safe (normal operation)	0-7	0-3	00-07
		Display off	24-26	9-10	18-1A
		Display dim	32-34	13	20-22
		Display bright	40-42	16	28-2A
		Home	64-66	25-26	40-42
		Lamp on	80-82	31-32	50-52
		Lamp off	96-98	38	60-62
		Shutdown	128-130	50-51	80-82
	Send "Shutdown" value for approximately two seconds	Reserved	131-255	51-100	83-FF

\* Note: The space marked RFU, reserved for future use, will default to the Random mode. Users wishing to use the Random function are cautioned to program with the values listed for Random and Random at Mirror Speed only, so that future protocols that make use of this RFU space do not necessitate reprogramming any shows.

\*\* Litho Notes:

- Indexed mode: wheel position will snap to center of apertures.
- Blink mode is the same as Indexed mode, except that the shutter will close during aperture-to-aperture movements
- Forward Spin and Reverse Spin modes: Rotational speed varies from slow to fast as the Litho Rotate High channel varies from 00h to FFh.
- Litho Scan: Scan dwell time is set by the Litho Rotate high, an 8-bit value.

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Proprietary Notice



# Technobeam®- With Iris

## DMX Protocol Chart

DMX	Function	Description	Decimal	Percent	Hex
<b>1</b>	<b>Pan</b>	<b>Pan Coarse (High)</b>	0 - 255	0-100	00-FF
<b>2</b>	<b>Pan</b>	<b>Pan Fine (Low)</b>	0 - 255	0-100	00-FF
<b>3</b>	<b>Tilt</b>	<b>Tilt Coarse (High)</b>	0 - 255	0-100	00-FF
<b>4</b>	<b>Tilt</b>	<b>Tilt Fine (Low)</b>	0 - 255	0-100	00-FF
<b>5</b>	<b>Color Function</b>	<b>Full Speed</b>			
		Indexed	0 - 15	0-6	00-0F
		Forward Spin	16-31	6-12	10-1F
		Reverse Spin	32-47	13-18	20-2F
		Continuous	48-63	19-25	30-3F
		Slow Scan	64-79	25-31	40-4F
		Fast Scan	80-95	31-37	50-5F
		Random	96-111	38-44	60-6F
		Blink-Indexed	112-127	44-50	70-7F
		<b>MSpeed Control</b>			
		Indexed	128-143	50-56	80-8F
		Forward Spin	144-159	57-62	90-9F
		Reverse Spin	160-175	63-69	A0-AF
		Continuous	176-191	69-75	B0-BF
		Slow Scan	192-207	75-81	C0-CF
		Fast Scan	208-223	82-88	D0-DF
		Random	224-239	88-94	E0-EF
		Blink-Indexed	240-255	94-100	F0-FF
<b>6</b>	<b>Color Wheel Position</b>	<b>Indexed and Blink Modes</b>			
		Color 1	0-23	0-9	00-17
		Color 2	24-31	9-12	18-1F
		Color 3	32-39	13-15	20-27
		Color 4	40-47	16-18	28-2F
		Color 5	48-55	19-22	30-37
		Color 6	56-63	22-25	38-3F
		Color 7	64-71	25-28	40-47
		Color 8	72-79	28-31	48-4F
		Color 9	80-87	31-34	50-57

7	Litho Wheel Function **	Color 10	88-95	35-37	58-5F
		Color 11	96-103	38-40	60-67
		Color 12	104-111	41-44	68-6F
		Color 13	112-127	44-50	70-7F
		Color 1/2	128-143	50-56	80-8F
		Color 2/3	144-151	57-59	90-97
		Color 3/4	152-159	60-62	98-9F
		Color 4/5	160-167	63-66	A0-A7
		Color 5/6	168-175	66-69	A8-AF
		Color 6/7	176-183	69-72	B0-B7
		Color 7/8	184-191	72-75	B8-BF
		Color 8/9	192-199	75-78	C0-C7
		Color 9/10	200-207	78-81	C8-CF
		Color 10/11	208-215	82-84	D0-D7
		Color 11/12	216-223	85-88	D8-DF
		Color 12/13	224-231	88-91	E0-E7
		Color 13/1	232-247	91-97	E8-F7
		Color 1	248-255	97-100	F8-FF
		<b>Continuously Variable Mode</b>			
		Color 1	0	0	00
		Color 2	19	8	13
		Color 3	39	15	27
		Color 4	58	23	3A
		Color 5	78	31	4E
		Color 6	98	38	62
		Color 7	117	46	75
		Color 8	137	54	89
		Color 9	156	61	9C
		Color 10	176	69	B0
		Color 11	196	77	C4
		Color 12	215	84	D7
		Color 13	235	92	EB
		Color 1	255	100	FF
		<b>Continuously Variable Forward Spin Mode</b>			
		Spin Stop	0-3	0-1	00-03
		Spin Forward Slowest	4	2	04
		Spin Forward Fastest	255	100	FF
		<b>Continuously Variable Reverse Spin Mode</b>			
		Spin Stop	0-3	0-1	00-03
		Spin Reverse Slowest	4	2	04
		Spin Reverse Fastest	255	100	FF
		<b>Random Mode</b>			
		Random Stop	0-3	0-1	00-03
		Random Slowest	4	2	04
		Random Fastest	255	100	FF
7	Litho Wheel Function **	<b>Full Speed</b>			
		Indexed	0-15	0-5	00-0F



		Forward rotate	16-31	6-12	10-1F
		Reverse rotate	32-47	13-18	20-2F
		Scan	48-63	19-24	30-3F
		Blink	64-79	25-30	40-4F
		Random	80-95	31-37	50-6F
		RFU (Default-Random)*	96-111	38-42	60-6F
		Wheel spin	112-127	43-49	70-7F
		<b>MSpeed Controlled</b>			
		Indexed	128-143	50-55	80-8F
		Forward rotate	144-159	56-62	90-9F
		Reverse rotate	160-175	63-68	A0-AF
		Scan	176-191	69-74	B0-BF
		Blink	192-207	75-80	C0-CF
		Random	208-223	81-87	D0-DF
		RFU (Default-Random)*	224-239	88-93	E0-EF
		Wheel spin	240-255	94-100	F0-FF
<b>8</b>	<b>Litho Wheel Position</b>	<b>Indexed Positions</b>			
		Position 0 (Open)	0-15	0-6	00-0F
		Position 1	16-47	6-18	10-2F
		Position 2	48-79	19-31	30-4F
		Position 3	80-111	31-44	50-6F
		Position 4	112-143	44-56	70-8F
		Position 5	144-175	57-69	90-AF
		Position 6	176-207	69-81	B0-CF
		Position 7	208-239	82-94	D0-EF
		Position 0 (Open)	240-255	94-100	F0-FF
<b>9</b>	<b>Litho Wheel Rotation</b>	<b>Indexed and Blink modes</b>			
		Indexable Positions	0-255	0-100	0-FF
		<b>Variable forward spin mode</b>			
		Spin stop	0-3	0-1	00-03
		Spin forward slowest	4	2	04
		Spin forward fastest	225	100	FF
		<b>Variable reverse spin mode</b>			
		Spin stop	0-3	0-1	00-03
		Spin reverse slowest	4	2	04
		Spin reverse fastest	225	100	FF
		<b>Continuously variable spin mode</b>			
		Fastest forward spin	0	0	00
		Slowest forward spin	127	49	7F
		Slowest reverse spin	128	50	80
		Fastest reverse spin	255	100	FF
		<b>Scan mode</b>			
		Scan slowest	0	0	00
		Scan fastest	255	100	FF
		<b>Random Mode (Pause Time)</b>			
		Spin stop	0-3	0-1	00-03

		Open/Stop	00	01	00-00
		Random slowest	4	2	04
		Random fastest	255	100	FF
<b>10</b>	<b>Iris</b>	<b>Variable Iris</b>			
		Close	0	0	00
		Variable Iris	1-127	1-50	01-7F
		Open	128-135	50-53	80-87
		<b>Iris Effects (Variable Ranges)</b>			
		Periodic Strobe	136-151	53-59	88-97
		Random Strobe	152-167	60-66	98-A7
		Ramp Open/Snap Shut	168-183	66-72	A8-B7
		Snap Open/Ramp Shut	184-199	72-78	B8-C7
		Ramp Open/Ramp Shut	200-215	78-84	C8-D7
		Random Ramp/Snap	216-231	85-91	D8-E7
		Random Snap/Ramp	232-247	91-97	E8-F7
		Open	248-255	97-100	F8-FF
<b>11</b>	<b>Effects Wheel</b>	<b>Full Speed</b>			
		Position 0 (Open)	0-25	0-10	00-19
		Position 1	26-51	10-20	1A-33
		Position 2	52-76	20-30	34-4C
		Position 3	77-102	30-40	4D-66
		Position 4	103-127	40-50	67-7F
		<b>MSpeed Controlled</b>			
		Position 0 (Open)	128-153	50-60	80-99
		Position 1	154-178	60-70	9A-B2
		Position 2	179-204	70-80	B3-CC
		Position 3	205-229	80-90	CD-E5
		Position 4	230-255	90-100	E6-FF
<b>12</b>	<b>Effects Rotate</b>	<b>Variable Ranges</b>			
		Fastest Reverse Rotate	0	0	00
		Slowest Reverse Rotate	120	47	78
		Rotate Stop (Static)	121-134	48-53	79-86
		Slowest Forward Rotate	135	53	87
		Fastest Forward Rotate	255	100	FF
<b>13</b>	<b>Focus</b>	<b>Variable Focus</b>			
		Focus image closer	0	0	00
		Focus image farther	255	100	FF
<b>14</b>	<b>Shutter</b>	<b>Normal</b>			
		Close	0-7	0-2	00-07
		Open	248-255	97-100	F8-FF
		<b>Strobe Effects (Variable Ranges)</b>			
		Periodic Strobe	8-67	3-26	08-43
		Random Strobe	68-127	27-49	44-7F

		Ramp Open/Snap Shut	128-187	50-73	80-BB
		Snap Open/Ramp Shut	188-247	74-96	BC-F7
<b>15</b>	<b>Dimmer</b>	<b>Variable Range</b>			
		Closed	0	0	00
		Open	255	100	FF
<b>16</b>	<b>MSpeed</b>	<b>Ranges</b>			
		Controller crossfade	0-3	0-1	00-03
		Longest (252.7 sec.)	4	2	4
		Shortest (0.15 sec.)	255	100	FF
<b>17</b>	<b>Macros / LAD</b>	<b>Selections</b>			
		No Macro / LAD off	0-7	0-3	00-07
		Macro 1	8-11	3-4	08-0B
		Macro 2	12-15	5-6	0C-0F
		Macro 3	16-19	6-8	10-13
		Macro 4	20-23	8-9	14-17
		Macro 5	24-27	9-11	18-1B
		Macro 6	28-31	11-12	1C-1F
		Macro 7	32-35	13-14	20-23
		Macro 8	36-39	14-15	24-27
		Macro 9	40-43	16-17	28-2B
		Macro 10	44-47	17-18	2C-2F
		Macro 11	48-51	19-20	30-33
		Macro 12	52-55	20-22	34-37
		Macro 13	56-59	22-23	38-3B
		Macro 14	60-63	24-25	3C-3F
		Macro 15	64-67	25-26	40-43
		Macro 16	68-71	27-28	44-47
		Macro 17	72-75	28-29	48-4B
		Macro 18	76-79	30-31	4C-4F
		Macro 19	80-83	31-33	50-53
		Macro 20	84-87	33-34	54-57
		Macro 21	88-91	35-36	58-5B
		Macro 22	92-95	36-37	5C-5F
		Macro 23	96-99	38-39	60-63
		Macro 24	100-103	39-40	64-67
		Macro 25	104-107	41-42	68-6B
		Macro 26	108-111	42-44	6C-6F
		Macro 27	112-115	44-45	70-73
		Macro 28	116-119	46-47	74-77
		LAD Off / No Macros	120-127	48-50	78-7F
		LAD Modulate (Variable)	128-247	51-97	80-F7
		LAD On	248-255	98-100	F8-FF
<b>18</b>	<b>Control</b>	<b>Selections</b>			
	After choosing a control channel value, set the	Safe (normal operation)	0-7	0-3	00-07

Shutter channel to "O" to access the Control channel settings       Send "Shutdown" value for approximately two seconds	Display off	24-26	9-10	18-1A
	Display dim	32-34	13	20-22
	Display bright	40-42	16	28-2A
	Home	64-66	25-26	40-42
	Lamp on	80-82	31-32	50-52
	Lamp off	96-98	38	60-62
	Shutdown	128-130	50-51	80-82
	Reserved	131-255	51-100	83-FF

\* Note: The space marked RFU, reserved for future use, will default to the Random mode. Users wishing to use the Random function are cautioned to program with the values listed for Random and Random at Mirror Speed only, so that future protocols that make use of this RFU space do not necessitate reprogramming any shows.

**\*\* Litho Notes:**

- Indexed mode: wheel position will snap to center of apertures.
- Blink mode is the same as Indexed mode, except that the shutter will close during aperture-to-aperture movements
- Forward Spin and Reverse Spin modes: Rotational speed varies from slow to fast as the Litho Rotate High channel varies from 00h to FFh.
- Litho Scan: Scan dwell time is set by the Litho Rotate high, an 8-bit value.





## Studio Color® 575 DMX Protocol Chart

Channel	Function	Description	Decimal	Percent	Hex
<b>1</b>	Pan MSB	<i>coarse positioning, 8 bit;  8-bit controllers use only high byte</i>	0-255	0-100	00-FF
<b>2</b>	Pan LSB	<i>fine positioning</i>	0-255	0-100	00-FF
<b>3</b>	Tilt MSB	<i>coarse positioning, 8 bit;  8-bit controllers use only high byte</i>	0-255	0-100	00-FF
<b>4</b>	Tilt LSB	<i>fine positioning</i>	0-255	0-100	00-FF
<b>5</b>	Color functions	<i>default- color wheel continuous</i>  <i>F1- allows the color mixing wheels to make two complete rotations</i>  <i>F2- locks dim, color, and effect systems to MSpeed</i>  <i>F3- enables</i>			

			<i>forward color spins on the fixed color wheel or synchronized color mix sequences</i>	0	0	00
			<i>F4- enables</i>	16	8	10
			<i>reverse</i>	32	14	20
			<i>color spins on the fixed</i>	48	20	30
			<i>color wheel or</i>	64	26	40
			<i>random</i>	80	33	50
			<i>color</i>	96	39	60
			<i>mix</i>	112	45	70
			<i>cycling</i>	128	51	80
			<i>from the</i>	144	58	90
			<i>subtractive</i>	160	64	A0
			<i>color wheels</i>	176	70	B0
			<i>F5- color wheel</i>	192	76	C0
			<i>color lock and</i>	208	83	D0
			<i>quickest path</i>	224	89	E0
			<i>default</i>	240	95	F0
			F3			
			F4			
			F5			
			F1			
			F1 and F3			
			F1 and F4			
			F1 and F5			
			F2			
			F2 and F3			

		F2 and F4			
		F2 and F5			
		F1 and F2			
		F1, F2, and F3			
		F1, F2, and F4			
		F1, F2, and F5			
6	Color wheel	<i>default-continuously variable</i>	0 & 255 44	0 & 100 17	00&FF 2C
		pos 0 - open	86	34	56
		pos 1 - CTO	128	50	80
		pos 2 - pink	170	66	AA
		pos 3 - magenta	213	83	D5
		pos 4 - red			
		pos 5 - aqua			
		<i>F3- variable forward spins/synchronized color mix sequences spin stop</i>	0-3 4 127	0-1 2 48	00-03 04 7F
		spin forward slowest	128	50	80
			255	100	FF
		spin forward fastest			
		color mix sequence slowest			
		color mix sequence fastest	0-3 4	0-1 2	00-03 04
		<i>F4- variable reverse spins /random color mix cycling</i>	127 128	48 50	7F 80
		spin stop	255	100	FF
		spin reverse slowest			
			0-43	0-17	0-2B

		spin reverse fastest	44-85	18-33	2C-55
		color mix cycle slowest	86-127	34-50	56-79
			128-169	51-66	80-A9
		color mix cycle fastest	170-212	67-83	AA-D4
		<i>F5- color lock and quickest path</i>	213-255	84-100	D5-FF
		pos 0 - open			
		pos 1 - CTO			
		pos 2 - pink			
		pos 3 - magenta			
		pos 4 - red			
		pos 5 - aqua			
<b>7</b>	Cyan mix	<i>red subtractive</i>	0	0	00
		cyan in	255	100	FF
		cyan out			
<b>8</b>	Magenta mix	<i>green subtractive</i>	0	0	00
		magenta in	255	100	FF
		magenta out			
<b>9</b>	Yellow mix	<i>blue subtractive</i>	0	0	00
		yellow in	255	100	FF
		yellow out			
<b>10</b>	Lens wheel  (effects wheel 1)	<i>full rotation, continuously variable</i>	0 & 255	0 & 100	00&FF
		open	64	25	40
		wide angle filter	128	50	80
		narrow horizontal shaping center axis	192	75	C0
		wide vertical shaping center axis			
<b>11</b>	Frost wheel  (effects wheel 2)	<i>full rotation, continuously variable</i>	0 & 255	0 & 100	00&FF
		open	64	25	40
		frost			



		most	128	50	80
		narrow vertical shaping center axis	192	75	C0
		wide horizontal shaping center axis			
<b>12</b>	Shutter	closed	0-7	0-2	00-07
		strobe slowest	8	3	08
		strobe fastest	127	49	7F
		random strobe-low saturation	128	50	80
			247	96	F7
		random strobe-high saturation	248-255	97-100	F8-FF
		open			
<b>13</b>	Dimmer	<i>iris</i>	0	0	0
		closed	255	100	FF
		open			
<b>14</b>	MSpeed	<i>movement speed</i>	0-3	0-1	00-03
		controller cross fade	4	2	04
			255	100	FF
		slowest			
		fastest			
<b>15</b>	Control	safe	0	0	0
		home	64	25	40
		shutdown	128	50	80
<b>16</b>	Checksum	set to default value (00)	00	0	00



# EC-1™ DMX Protocol Chart

Channel	Function	Description	Decimal	Fader percent	Hex
1	Color functions	<i>default-color wheel continuous</i>			
		<i>F1- allows the color mixing wheels to make two complete rotations</i>			
		<i>F2- locks dim, color, and effect systems to MSpeed</i>			
		<i>F3- enables forward color spins on the fixed color wheel or synchronized color mix sequences</i>	0	0	00
		<i>F4- enables reverse</i>	16	8	10h

	<i>reverse</i>	32	14	20n
	<i>color</i>			
	<i>spins</i>	48	20	30h
	<i>on the</i>			
	<i>fixed</i>	64	26	40h
	<i>color</i>			
	<i>wheel</i>	80	33	50h
	<i>or</i>			
	<i>random</i>	96	39	60h
	<i>color</i>			
	<i>mix</i>	112	45	70h
	<i>cycling</i>			
	<i>from the</i>	128	51	80h
	<i>subtractive</i>			
	<i>color</i>	144	58	90h
	<i>wheels</i>			
		160	64	a0h
	<i>F5-</i>			
	<i>color</i>	176	70	b0h
	<i>wheel</i>			
	<i>color</i>	192	76	c0h
	<i>lock</i>			
	<i>and</i>	208	83	d0h
	<i>quickest</i>			
	<i>path</i>	224	89	e0h
	default	240	95	f0h
	F3			
	F4			
	F5			
	F1			
	F1 and F3			
	F1 and F4			
	F1 and F5			
	F2			
	F2 and F3			
	F2 and F4			
	F2 and F5			
	F1 and F2			
	F1, F2, and F3			
	F1, F2, and F4			
	- . -			

		F1, F2, and F5			
<b>2</b>	Color wheel	<i>default- continuously variable</i>	0 & 255	0 & 100	00 & ffh
			44	17	2ch
		pos 0 - open	86	34	56h
		pos 1 - CTO	128	50	80h
		pos 2 - pink	170	66	aah
		pos 3 - magenta	213	83	d5h
		pos 4 - red			
		pos 5 - aqua			
		<i>F3- variable forward spins/synchronized color mix sequences spin stop</i>	0-3	0-1	00-03h
			4	2	04h
			127	48	7fh
		spin forward slowest	128	50	80h
			255	100	ffh
		spin forward fastest			
		color mix sequence slowest			
		color mix sequence fastest	0-3	0-1	00-03h
			4	2	04h
		<i>F4- variable reverse spins /random color mix cycling</i>	127	48	7fh
			128	50	80h
		spin stop	255	100	ffh
		spin reverse slowest			
			0-43	0-17	0-2bh
		spin reverse fastest	44-85	18-33	2ch-55h
		color mix cycle slowest	86-127	34-50	56h-79h
			128-169	51-66	80h-a9h
		color mix cycle fastest	170-212	67-83	aah-d4h
		<i>F5- color lock and quickest path</i>	213-255	84-100	d5h-ffh
		pos 0 - open			
		pos 1 - CTO			



		pos 2 - pink pos 3 - magenta pos 4 - red pos 5 - aqua			
<b>3</b>	Cyan mix	<i>red subtractive</i> cyan in cyan out	0 255	0 100	00h ffh
<b>4</b>	Magenta mix	<i>green subtractive</i> magenta in magenta out	0 255	0 100	00h ffh
<b>5</b>	Yellow mix	<i>blue subtractive</i> yellow in yellow out	0 255	0 100	00h ffh
<b>6</b>	Lens wheel  (effects wheel 1)	<i>full rotation, continuously variable</i> open wide angle filter narrow horizontal shaping center axis wide vertical shaping center axis	0 & 255 64 128 192	0 & 100 25 50 75	00 & ffh 40h 80h c0h
<b>7</b>	Frost wheel  (effects wheel 2)	<i>full rotation, continuously variable</i> open frost narrow vertical shaping center axis wide horizontal shaping center axis	0 & 255 64 128 192	0 & 100 25 50 75	00 & ffh 40h 80h c0h
<b>8</b>	Shutter	closed strobe slowest strobe fastest	0-7 8 127	0-2 3 49	00h-07h 08h 7fh

		random strobe-low saturation	128	50	80h
			247	96	f7h
		random strobe-high saturation	248-255	97-100	f8h-ffh
		open			
<b>9</b>	Dimmer	<i>iris</i>	0	0	0h
		closed	255	100	ffh
		open			
<b>10</b>	MSpeed	<i>movement speed</i>	0-3	0-1	00-03h
		controller cross fade	4	2	04h
			255	100	ffh
		slowest			
		fastest			
<b>11</b>	Control	safe	0	0	0h
		home	64	25	40h
		shutdown	128	50	80h
<b>12</b>	Checksum	set to default value (00)	00	0	00h

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Address Dipswitch 7 off and 8 On for Mode 1

<b>Channel</b>	<b>Assignment</b>	<b>Range %</b>	<b>Construct Parameter</b>
<b>1</b>	Pan coarse adjustment		Position
<b>2</b>	Pan fine adjustment		Position
<b>3</b>	Tilt coarse adjustment		Position
<b>4</b>	Tilt fine adjustment		Position
<b>5</b>	Color Wheel	Full  0	Color 1 (open) Half color 1 and 2 Color 2 Half color 2 and 3 Color 3 Half color 3 and 4 Color 4 Half color 4 and 5 Color 5 Half color 5 and 6 Color 6 Half color 6 and 7 Color 7 Half color 7 and 8 Color 8 Half color 8 and 1 Forward spin speed 8 Forward spin speed 7 Forward spin speed 6 Forward spin speed 5 Forward spin speed 4 Forward spin speed 3 Forward spin speed 2 Forward spin speed 1 Reverse spin speed 1 Reverse spin speed 2 Reverse spin speed 3 Reverse spin speed 4 Reverse spin speed 5 Reverse spin speed 6 Reverse spin speed 7 Reverse spin speed 8 Color 1 (open)
<b>6</b>	Cyan (Red)		Color Mix

<b>7</b>	Magenta (Green)		Color Mix
<b>8</b>	Yellow (Blue)		Color Mix
<b>9</b>	Static litho	Full  0	Litho 1 (open) Litho 2 Litho 3 Litho 4 Litho 5 Litho 6 Litho 7 Litho 8 Forward spin speed 8 Forward spin speed 7 Forward spin speed 6 Forward spin speed 5 Forward spin speed 4 Forward spin speed 3 Forward spin speed 2 Forward spin speed 1 Reverse spin speed 1 Reverse spin speed 2 Reverse spin speed 3 Reverse spin speed 4 Reverse spin speed 5 Reverse spin speed 6 Reverse spin speed 7 Reverse spin speed 8 Litho 1 (open)
<b>10</b>	Rotating Litho	Full  0	Position 3 (open) Reverse rotate 5 Reverse rotate 4 Reverse rotate 2 Reverse rotate 1 Forward rotate 5 Forward rotate 4 Forward rotate 2 Forward rotate 1 Position 5 Position 4 Position 3 (open) Position 2 Position 1 Position 3 (open)
<b>11</b>	Rotate (use with Channel 10)		For Rotating Litho rotate mode use Ch 11 to set rotation speed For Rotating Litho position mode use Ch 11 to set the index from 0 to 360 degrees
<b>12</b>	Zoom		Zoom in/out
<b>13</b>	Focus		Focus in/out
<b>14</b>	Iris		Iris open/close
<b>15</b>	Effects Wheel	Full  0	Effect 4 (open) Effect 8 Effect 7 Effect 6 Effect 5 Effect 4 Effect 3 Effect 2 Effect 1 Effect 4 (open)



<b>16</b>	Frost		Frost in/out
<b>17</b>	Shutter	Full	Open Closed Strobe speed 8 Strobe speed 7 Strobe speed 6 Strobe speed 5 Strobe speed 4 Strobe speed 3 Strobe speed 2 Strobe speed 1
		0	Open Closed
<b>18</b>	Dim		Dim open/close
<b>19</b>	Motor Speed	Full	Speed 99
		0	Speed 1 Speed 94
<b>20*</b>	Control		50% fader – shutdown 25% fader – home

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## Cyberlight® DMX Protocol Chart - Mode 2

Address Dipswitch 7 on and 8 Off for Mode 2

Channel	Assignment	Channel Value (%)	Channel Value (numerical)	Channel Value (hex)	Construct Parameter
<b>1</b>	Pan coarse adjustment	0-100%	0-255	0-FF	Position
<b>2</b>	Pan fine adjustment	0-100%	0-255	0-FF	Position
<b>3</b>	Tilt coarse adjustment	0-100%	0-255	0-FF	Position
<b>4</b>	Tilt fine adjustment	0-100%	0-255	0-FF	Position
<b>5</b>	Color Wheel <i>Full Speed</i>	Full	255	FF	Color 1 (open)
		98	250	FA	Half color 1 and 2
		96	245	F5	Color 2
		94	240	F0	Half color 2 and 3
		93	237	ED	Color 3
		91	232	E8	Half color 3 and 4
		90	230	E6	Color 4
		88	224	E0	Half color 4 and 5
		87	222	DE	Color 5
		85	217	D9	Half color 5 and 6
		83	211	D3	Color 6
		82	209	D1	Half color 6 and 7
		80	204	CC	Color 7
		79	201	C9	Half color 7 and 8
		77	196	C4	Color 8
		76	194	C2	Half color 8 and 1
	Color Wheel <i>Mspeed</i>	74	189	BD	Color 1 (open)
		73	186	BA	Half color 1 and 2
		71	181	B5	Color 2
		70	179	B3	Half color 2 and 3
		68	173	AD	Color 3
		66	168	A8	Half color 3 and 4
		65	166	A6	Color 4
		63	161	A1	Half color 4 and 5
		62	158	9E	Color 5
		61	156	9C	Half color 5 and 6
		59	150	96	Color 6
		57	145	91	Half color 6 and 7
		56	143	8F	Color 7
		54	138	8A	Half color 7 and 8
		52	133	85	Color 8
		51	130	82	Half color 8 and 1

<b>5</b>	Color Wheel <i>Spin Speed</i>	50	127	7F	Forward spin speed – fastest • • •
		26	66	42	Forward spin speed – slowest
		25	64	40	Reverse spin speed – slowest • • •
		0 0	2  0	2	Reverse spin speed – fastest Color 1 (open)
<b>6</b>	Cyan (Red)	0-100%	0-255	0-FF	Color Mix
<b>7</b>	Magenta (Green)	0-100%	0-255	0-FF	Color Mix
<b>8</b>	Yellow (Blue)	0-100%	0-255	0-FF	Color Mix
<b>9</b>	Static litho <i>Full Speed</i>	Full	255	FF	Litho 1 (open)
		98	250	FA	Litho 1 shake
		96	245	F5	wide
		94	240	F0	Litho 2
		93	237	ED	Litho 2 shake
		91	232	E8	wide
		90	230	E6	Litho 3
		88	224	E0	Litho 3 shake
		87	222	DE	wide
		85	217	D9	Litho 4
		83	211	D3	Litho 4 shake
		82	209	D1	wide
		80	204	CC	Litho 5
		79	201	C9	Litho 5 shake
		77	196	C4	wide
		76	194	C2	Litho 6
					Litho 6 shake
					wide
					Litho 7
					Litho 7 shake
					wide
					Litho 8
					Litho 8 shake
					wide
	Static litho <i>Mspeed</i>	74	189	BD	Litho 1 (open)
		73	186	BA	Litho 1 shake
		71	181	B5	narrow
		70	179	B3	Litho 2
		68	173	AD	Litho 2 shake
		66	168	A8	narrow
		65	166	A6	Litho 3
		63	161	A1	Litho 3 shake
		62	158	9E	narrow
		61	156	9C	Litho 4
		59	150	96	Litho 4 shake
		57	145	91	narrow
		56	143	8F	Litho 5
		54	138	8A	Litho 5 shake
		52	133	85	narrow
		51	130	82	Litho 6
					Litho 6 shake
					narrow
					Litho 7

					Litho 7 shake narrow Litho 8 Litho 8 shake narrow
<b>9</b>	Static litho  <i>Spin Speed</i>	50  26 25  0 0	127   66 64  2 0	7F   42 40  2 0	Forward spin speed – fastest • • • Forward spin speed – slowest Reverse spin speed – slowest • • • Reverse spin speed – fastest Litho 1 (open)
<b>10</b>	Rotating Litho  <i>Full Speed</i>	Full 98 95 91 87 83 80 76 72 68 64 61 58 54	255 250 242 232 222 212 204 194 184 173 163 156 150 138	FF FA F2 E8 DE D4 CC C2 B8 AD A3 9C 96 8A	Position 3 (open) Reverse rotate 5 Reverse rotate 4 Reverse rotate 2 Reverse rotate 1 Forward rotate 5 Forward rotate 4 Forward rotate 2 Forward rotate 1 Position 5 Position 4 Position 3 (open) Position 2 Position 1
	<i>MSpeed</i>	50 46 42 39 36 32 28 24 20 17 13 10 5 0	127 117 107 99 92 82 71 61 51 43 33 26 13 0	7F 75 6B 63 5C 52 47 3D 33 2B 21 1A D 0	Reverse rotate 5 Reverse rotate 4 Reverse rotate 2 Reverse rotate 1 Forward rotate 5 Forward rotate 4 Forward rotate 2 Forward rotate 1 Position 5 Position 4 Position 3 (open) Position 2 Position 1 Position 3 (open)
<b>11</b>	Rotate (use with Channel 10)	0-100%	0-255	0-FF	For Rotating Litho rotate mode use Ch 11 to set rotation speed For Rotating Litho position mode use Ch 11 to set the index from 0 to 360 degrees
<b>12</b>	Zoom	0-100%	0-255	0-FF	Zoom in/out



<b>13</b>	Focus	0-100%	0-255	0-FF	Focus in/out
<b>14</b>	Iris	0-100%	0-255	0-FF	Iris open/close
<b>15</b>	Effects Wheel  Full Speed	Full 96 91 85 80 73 67 62 56	255 245 232 217 204 186 171 158 143	FF F5 E8 D9 CC BA AB 9E 8F	Effect 4 – (open) Effect 8 – cyan color Effect 7 – diffusion Effect 6 – wide angle Effect 5 – magenta color Effect 4 – (open) Effect 3 – yellow color Effect 2 – CMY mosaic Effect 1 – prism
	Effects Wheel  <i>Mspeed</i>	50 44 37 33 27 21 14 8 0	127 112 94 84 69 54 36 20 0	7F 70 5E 54 45 36 24 14 0	Effect 8 – cyan color Effect 7 – diffusion Effect 6 – wide angle Effect 5 – magenta color Effect 4 – (open) Effect 3 – yellow color Effect 2 – CMY mosaic Effect 1 – prism Effect 4 – (open)
<b>16</b>	Frost  <i>Frost variable</i>  None to full	Full   50	255   129	FF   81	Frost – frost free • • • Frost – frost full
	Frost  <i>Full Frost Strobing</i>  (Frost in)	50  0 0	126   2  0	7E   2  0	Frost strobing – fastest • • • Frost strobing – slowest Frost – frost free
<b>17</b>	Shutter  <i>Strobe</i>  50 % duty cycle	Full 98 97   1 1 0	255  250  247   4	FF  FA  F7   4	Open Closed Strobe speed – fastest • • • Strobe speed – slowest Open Closed

			1 0	1 0	
<b>18</b>	Dim	100  0	255  0	FF  0	No dim  Full dim (blackout)
<b>19</b>	Motor Speed	Full  0	255-200  21 0	FF-C8  15 0	Speed 99 . . . Speed 1 Speed 95
<b>20*</b>	Control	50% 25%	128 64	80 40	shutdown home

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Proprietary Notice



# Cyberlight® DMX Protocol Chart - Mode 3

Address Dipswitch 7 and 8 On for Mode 3

Channel	Assignment	Range %	Construct Parameter
<b>1</b>	Pan coarse adjustment		Position
<b>2</b>	Pan fine adjustment		Position
<b>3</b>	Tilt coarse adjustment		Position
<b>4</b>	Tilt fine adjustment		Position
<b>5</b>	Color Wheel <i>Full Speed</i>	Full 98 96 94 93 91 90 88 87 85 83 82 80 79 77 76	Color 1 (open) Half color 1 and 2 Color 2 Half color 2 and 3 Color 3 Half color 3 and 4 Color 4 Half color 4 and 5 Color 5 Half color 5 and 6 Color 6 Half color 6 and 7 Color 7 Half color 7 and 8 Color 8 Half color 8 and 1
	Color Wheel <i>Mspeed</i>	74 73 71 70 68 66 65 63 62 61 59 57 56 54 52 51	Color 1 (open) Half color 1 and 2 Color 2 Half color 2 and 3 Color 3 Half color 3 and 4 Color 4 Half color 4 and 5 Color 5 Half color 5 and 6 Color 6 Half color 6 and 7 Color 7 Half color 7 and 8 Color 8 Half color 8 and 1
	Color Wheel	50	Forward spin speed – fastest •

	<i>Spin Speed</i>	26 25  0 0	<ul style="list-style-type: none"> <li>•</li> <li>•</li> </ul> Forward spin speed – slowest Reverse spin speed – slowest <ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> </ul> Reverse spin speed – fastest Color 1 (open)
<b>6</b>	Static litho  <i>Full Speed</i>	Full 98 96 94 93 91 90 88 87 85 83 82 80 79 77 76	Litho 1 (open) Litho 1 shake wide Litho 2 Litho 2 shake wide Litho 3 Litho 3 shake wide Litho 4 Litho 4 shake wide Litho 5 Litho 5 shake wide Litho 6 Litho 6 shake wide Litho 7 Litho 7 shake wide Litho 8 Litho 8 shake wide
	Static litho  <i>Mspeed</i>	74 73 71 70 68 66 65 63 62 61 59 57 56 54 52 51	Litho 1 (open) Litho 1 shake narrow Litho 2 Litho 2 shake narrow Litho 3 Litho 3 shake narrow Litho 4 Litho 4 shake narrow Litho 5 Litho 5 shake narrow Litho 6 Litho 6 shake narrow Litho 7 Litho 7 shake narrow Litho 8 Litho 8 shake narrow
	Static litho  <i>Spin Speed</i>	50  26 25  0 0	Forward spin speed – fastest <ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> </ul> Forward spin speed – slowest Reverse spin speed – slowest <ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> </ul> Reverse spin speed – fastest Litho 1 (open)
<b>7</b>	Rotating Litho  <i>Full Speed</i>	Full 98 95 91 87 83 80 76 72 68 64	Position 3 (open) Reverse rotate 5 Reverse rotate 4 Reverse rotate 2 Reverse rotate 1 Forward rotate 5 Forward rotate 4 Forward rotate 2 Forward rotate 1 Position 5 Position 4



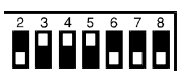






		61 58 54	Position 3 (open) Position 2 Position 1
	<i>Mspeed</i>	50 46 42 39 36 32 28 24 20 17 13 10 5 0	Reverse rotate 5 Reverse rotate 4 Reverse rotate 2 Reverse rotate 1 Forward rotate 5 Forward rotate 4 Forward rotate 2 Forward rotate 1 Position 5 Position 4 Position 3 (open) Position 2 Position 1 Position 3 (open)
<b>8</b>	Rotate (use with Channel 7)		For Rotating Litho rotate mode use Ch 8 to set rotation speed For Rotating Litho position mode use Ch 8 to set the index from 0 to 360 degrees
<b>9</b>	Focus		Focus in/out
<b>10</b>	Iris		Iris open/close
<b>11</b>	Effects Wheel  Full Speed	Full 96 91 85 80 73 67 62 56	Effect 4 – (open) Effect 8 – cyan color corrector Effect 7 – diffusion Effect 6 – wide angle Effect 5 – magenta color corrector Effect 4 – (open) Effect 3 – yellow color corrector Effect 2 – CMY tri color mosaic Effect 1 – prism
<b>11</b>	Effects Wheel  <i>Mspeed</i>	50 44 37 33 27 21 14 8 0	Effect 8 – cyan color corrector Effect 7 – diffusion Effect 6 – wide angle Effect 5 – magenta color corrector Effect 4 – (open) Effect 3 – yellow color corrector Effect 2 – tri color mosaic (C-M-Y) Effect 1 – prism Effect 4 – (open)
<b>12</b>	Shutter  <i>Strobe</i>  50 % duty cycle	Full 98 97   1 1 0	Open Closed Strobe speed – fastest • • • Strobe speed – slowest Open Closed
<b>13</b>	Dim		Dim open/close
<b>14</b>	Motor Speed	Full    0	Speed 97 • • • Speed 1 Speed 94
<b>15*</b>	Control		50% fader – shutdown 25% fader – home

## DMX Mode

You can control the AFI000 with DMX seven different ways. Three personality DIP switches labeled dmX intensity, dmX duration, and dmX rate control their respective functions. The following table illustrates how the various settings of these DIP switches effect the way the DMX data should be sent.

**Table 3: DMX Personality Switch Settings**

DMX Personalities		DMX Data Assignments		
		intensity is first DMX byte	duration is minimum	rate is set by DMX refresh <sup>1</sup>
		intensity is first DMX byte	duration is second DMX byte <sup>2</sup>	rate is set by DMX refresh <sup>1</sup> †
		intensity is first DMX byte	duration is second DMX byte	rate is third DMX byte <sup>3</sup>
		intensity is first DMX byte	duration is minimum	rate is second DMX byte <sup>3</sup>
		intensity is preset to $\frac{1}{2}$	duration is minimum	rate is first DMX byte
		intensity is preset to $\frac{1}{2}$	duration is first DMX byte <sup>2</sup>	rate is set by DMX refresh <sup>1</sup>
		intensity is preset to $\frac{1}{2}$	duration is first DMX byte	rate is second DMX byte <sup>3</sup>
Intensity byte from DMX	Values from 0–255 are scaled by the fixture into 64 intensities.			
Duration byte from DMX	Values from 0–255 are scaled by the fixture into 64 durations. Value 0 will flash the lamp for approx. 4 milliseconds, 255 will flash it for a little more than 0.5 second.			
Rate byte from DMX	Values from 0–255 are scaled by the fixture into 64 rates. The lowest rate is a one shot move that requires a change in intensity or duration to flash again. The highest rates will appear as “latch on”—flash at 120 flashes/sec on a 60-Hz line and 100 flashes/sec on a 50 Hz line.			

<sup>1</sup>Performance of fixtures run off of a DMX board will be heavily dependent on the intelligence and versatility of the DMX board when rate is set by the DMX refresh. Higher rates can be achieved if smaller data packets can be sent more often.

<sup>2</sup>By setting duration to a long enough period and a high rate, latch on is possible. Experiment with this.

<sup>3</sup>When using DMX to control rate, setting the slider at its lowest setting gives a “one shot” effect that only flashes the fixture once when the intensity or duration settings change. If you want to see what changes in intensity and duration look like while programming, move the rate slider up a small amount to take it out of the “one shot” mode.

†The Mini AFI000 Controller and AFI000 LCD Controller use this 2 Channel DMX Mode.

## Extended DMX for the Intellabeam 700Hx

The Intellabeam 700Hx now supports four additional implementations of the USITT DMX-512 protocol. These are available as of ML25F Ver 3.04.

The first of the implementations uses 12 DMX channels to allow greater control of the Intellabeam fixture for use with any traditional DMX lighting board. The second implementation adds one additional channel to the first, to allow for homing of individual instruments.

The third implementation, called extended binary DMX, uses 11 DMX channels in a manner similar to the Intellabeams' native protocol. This is intended for use only with the newer generation of intelligent control systems, and not for direct control from an analog fader or voltage source. Several values in this protocol are bit encoded and therefore not suited for direct live control from traditional theatrical controls. The fourth DMX implementation adds a checksum channel for greater data integrity.

The extended DMX modes are selected using personality dipswitches on the Intellabeam fixture, according to the following table:

PERSONALITY DIPSWITCH	1	2	3	4	5	6	7	8
7 channel DMX			On for chan 1-256	On for chan 257- 501	OFF	OFF		OFF
8 channel DMX (with speed channel)			On for chan 1-256	On for chan 257- 501	OFF	OFF		ON
7 channel DMX for high resolution DMX Boards			On for chan 1-256	On for chan 257- 501	ON	OFF		OFF
8 channel DMX for high resolution DMX Boards			On for chan 1-256	On for chan 257- 501	ON	OFF		ON
12 channel extended DMX (no home channel)			On for chan 1-256	On for chan 257- 501	OFF	ON		OFF
13 channel extended DMX (channel 13 for homing)			On for chan 1-256	On for chan 257- 501	OFF	ON		ON
11 channel extended Binary DMX (no Checksum)			On for chan 1-256	On for chan 257- 501	ON	ON		OFF
12 channel extended Binary DMX (with Checksum)			On for chan 1-256	On for chan 257- 501	ON	ON		ON

This document is an extension of USING THE USITT DMX-512 PROTOCOL TO CONTROL THE INTELLABEAM 700Hx FIXTURE. Refer to that document for basic details of DMX operation

## 12/13 Channel Extended DMX

=====

### 1. Pan high, MSB

### 2. Pan low, LSB

The first two channels are combined to form a 16 bit value for pan position. The full range 0-65535 (0-FFFFh) is used, with 32768 (8000h) as the center position. Scaling to fixture resolution occurs in the fixture.

### 3. Tilt high, MSB

### 4. Tilt low, LSB

The first two channels are combined to form a 16 bit value for tilt position. The full range 0-65535 (0-FFFFh) is used, with 32768 (8000h) as the center position. Scaling to fixture resolution occurs in the fixture.

### 5. Color select

This channel selects one of twelve color selections or combinations -OR- one of eight spin speeds. The exact function depends on the setting of the Color mode channel (6)

### 6. Color mode

This channels selects one of eight possible modes of operation for the Color select channel. These modes are, in order from zero to full:

1. Color, with color change at full speed
2. Color, with color change at mspeed (tracks speed of beam motion)
3. Color Scan at full speed
4. Color Scan with mspeed
5. Forward Color Spin
6. Reverse Color Spin
7. Half Colors, with color change at full speed
8. Half Colors, with color change at mspeed (tracks speed of beam motion)

### 7. Gobo select

This channel selects one of twelve gobos -OR- one of eight spin speeds. The exact function depends on the setting of the Gobo mode channel (8)

### 8. Gobo mode

This channels selects one of eight possible modes of operation for the Gobo select channel. These modes are, in order from zero to full:

1. Gobo, with color change at full speed
2. Gobo, with color change at mspeed (tracks speed of beam motion)
3. Slow Gobo Scan
4. Fast Gobo Scan
5. Forward Gobo Spin
6. Reverse Gobo Spin
7. Slow Gobo Scan (reserved for future changes)
8. Fast Gobo Scan (reserved for future changes)

### 9. Shutter

This function is identical to the seven and eight channel modes. The values are, in order from zero to full:

1. Closed
2. Open
3. Strobe speed 1
4. Strobe speed 2
5. Strobe speed 3



6. Strobe speed 4
7. Strobe speed 5
8. Strobe speed 6
9. Strobe speed 7
10. Strobe speed 8
11. Closed
12. Open

#### 10. Dim

The dim channel is a full range 8 bit value. Blackout is at 0, Full output is at 255 (FFh)

#### 11. Iris

The iris channel is a full range 8 bit value. Minimum iris is at 0, Full open iris is at 255 (FFh)

#### 12. Speed

The speed channel is a full range 8 bit value. The function is, from zero to full:

automatic speed control (as in 7 chan mode)  
 slowest speed (longest time)  
 .  
 .  
 fastest speed (shortest time)

Values between 95% and 99% are best for editing or continuous control such as cross fades or trackballs.

#### 13. Home (if selected)

To home fixture, hold this channel at 50% (+/- 5%) for at least 3 seconds.

#### 11/12 Channel Extended Binary DMX =====

##### 1. Pan high, MSB

##### 2. Pan low, LSB

The first two channels are combined to form a 16 bit value for pan position. The full range 0-65535 (0-FFFFh) is used, with 32768 (8000h) as the center position. Scaling to fixture resolution occurs in the fixture.

##### 3. Tilt high, MSB

##### 4. Tilt low, LSB

The first two channels are combined to form a 16 bit value for tilt position. The full range 0-65535 (0-FFFFh) is used, with 32768 (8000h) as the center position. Scaling to fixture resolution occurs in the fixture.

#### 5. Color

The color channel is bit encoded as follows, this is identical to the color channel of the Lightwave fixture protocol.

00shcccc	cccc	=	COLOR number (0-11d), 0 = color number 1
	s	=	speed of gobo changes
	0	=	fastest possible speed
	1	=	proportional to mspeed
	h	=	half colors or color oscillations.
	0	=	normal colors
	1	=	halfway between color and color+1 or oscillating between two colors as set on fixture.

-or-

## 6. Gobo

-or-

## 7. Shutter

-or-

8. Dim

## 9. Iris

## 10. Speed

zero to full =

## 11. Extra byte

```

1000rrsh      EXTRA byte
               s      =      shutdown bit
               1      =      shutdown fixture

```

h            =        home bit

1            =        home fixture on 0 to 1 transition.  
To home: set to 1 for one or more  
packets, then reset to 0.

r            =        reserved for future use.  
Must be reset to 0.

## 12. Checksum (if selected)

The check sum is the 8 bit LSB of the arithmetic sum of the 8 bit values of channels 1 through 11. In other words, add the first 11 channels, and divide by 256. The remainder of the division is the checksum.

Extended DMX for the Intellabeam 700Hx

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# Dipswitch Chart

The following table lists the dipswitch settings for DMX addressing of Intellabeam®, Trackspot®, AF1000, etc. Use personality dipswitch 3 on for channels 1-256 and 4 on for channels 257-512.

## Address    Address +256    Dipswitch Setting (Address switches 1-8)

1	(257)						
2	(258)	1					
3	(259)		2				
4	(260)	1	2				
5	(261)			3			
6	(262)	1		3			
7	(263)		2	3			
8	(264)	1	2	3			
9	(265)				4		
10	(266)	1			4		
11	(267)		2		4		
12	(268)	1	2		4		
13	(269)			3	4		
14	(270)	1		3	4		
15	(271)		2	3	4		
16	(272)	1	2	3	4		
17	(273)					5	
18	(274)	1				5	
19	(275)		2			5	
20	(276)	1	2			5	
21	(277)			3		5	
22	(278)	1		3		5	
23	(279)		2	3		5	
24	(280)	1	2	3		5	
25	(281)				4	5	
26	(282)	1			4	5	
27	(283)		2		4	5	
28	(284)	1	2		4	5	
29	(285)			3	4	5	



30	(286)	1		3	4	5	
31	(287)		2	3	4	5	
32	(288)	1	2	3	4	5	
33	(289)						6
34	(290)	1					6
35	(291)		2				6
36	(292)	1	2				6
37	(293)			3			6
38	(294)	1		3			6
39	(295)		2	3			6
40	(296)	1	2	3			6
41	(297)				4		6
42	(298)	1			4		6
43	(299)		2		4		6
44	(300)	1	2		4		6
45	(301)			3	4		6
46	(302)	1		3	4		6
47	(303)		2	3	4		6
48	(304)	1	2	3	4		6
49	(305)					5	6
50	(306)	1				5	6
51	(307)		2			5	6
52	(308)	1	2			5	6
53	(309)			3		5	6
54	(310)	1		3		5	6
55	(311)		2	3		5	6
56	(312)	1	2	3		5	6
57	(313)				4	5	6
58	(314)	1			4	5	6
59	(315)		2		4	5	6
60	(316)	1	2		4	5	6
61	(317)			3	4	5	6
62	(318)	1		3	4	5	6
63	(319)		2	3	4	5	6
64	(320)	1	2	3	4	5	6
65	(321)						7
66	(322)	1					7
67	(323)		2				7
68	(324)	1	2				7
69	(325)			3			7
70	(326)	1		3			7
71	(327)		2	3			7
72	(328)	1	2	3			7
73	(329)				4		7
74	(330)	1			4		7

74	(330)	1			74	1		
75	(331)		2		4	7		
76	(332)	1	2		4	7		
77	(333)			3	4	7		
78	(334)	1		3	4	7		
79	(335)		2	3	4	7		
80	(336)	1	2	3	4	7		
81	(337)				5	7		
82	(338)	1			5	7		
83	(339)		2		5	7		
84	(340)	1	2		5	7		
85	(341)			3	5	7		
86	(342)	1		3	5	7		
87	(343)		2	3	5	7		
88	(344)	1	2	3	5	7		
89	(345)				4	5	7	
90	(346)	1			4	5	7	
91	(347)		2		4	5	7	
92	(348)	1	2		4	5	7	
93	(349)			3	4	5	7	
94	(350)	1		3	4	5	7	
95	(351)		2	3	4	5	7	
96	(352)	1	2	3	4	5	7	
97	(353)						6	7
98	(354)	1					6	7
99	(355)		2				6	7
100	(356)	1	2				6	7
101	(357)			3			6	7
102	(358)	1		3			6	7
103	(359)		2	3			6	7
104	(360)	1	2	3			6	7
105	(361)				4		6	7
106	(362)	1			4		6	7
107	(363)		2		4		6	7
108	(364)	1	2		4		6	7
109	(365)			3	4		6	7
110	(366)	1		3	4		6	7
111	(367)		2	3	4		6	7
112	(368)	1	2	3	4		6	7
113	(369)					5	6	7
114	(370)	1				5	6	7
115	(371)		2			5	6	7
116	(372)	1	2			5	6	7
117	(373)			3		5	6	7
118	(374)	1		3		5	6	7

119	(375)		2	3		5	6	7	
120	(376)	1	2	3		5	6	7	
121	(377)				4	5	6	7	
122	(378)	1			4	5	6	7	
123	(379)		2		4	5	6	7	
124	(380)	1	2		4	5	6	7	
125	(381)			3	4	5	6	7	
126	(382)	1		3	4	5	6	7	
127	(383)		2	3	4	5	6	7	
128	(384)	1	2	3	4	5	6	7	
129	(385)								8
130	(386)	1							8
131	(387)		2						8
132	(388)	1	2						8
133	(389)			3					8
134	(390)	1		3					8
135	(391)		2	3					8
136	(392)	1	2	3					8
137	(393)				4				8
138	(394)	1			4				8
139	(395)		2		4				8
140	(396)	1	2		4				8
141	(397)			3	4				8
142	(398)	1		3	4				8
143	(399)		2	3	4				8
144	(400)	1	2	3	4				8
145	(401)					5			8
146	(402)	1				5			8
147	(403)		2			5			8
148	(404)	1	2			5			8
149	(405)			3		5			8
150	(406)	1		3		5			8
151	(407)		2	3		5			8
152	(408)	1	2	3		5			8
153	(409)				4	5			8
154	(410)	1			4	5			8
155	(411)		2		4	5			8
156	(412)	1	2		4	5			8
157	(413)			3	4	5			8
158	(414)	1		3	4	5			8
159	(415)		2	3	4	5			8
160	(416)	1	2	3	4	5			8
161	(417)						6		8
162	(418)	1					6		8
163	(419)		2				6		8

163	(419)		2			6	8	
164	(420)	1	2			6	8	
165	(421)			3		6	8	
166	(422)	1		3		6	8	
167	(423)		2	3		6	8	
168	(424)	1	2	3		6	8	
169	(425)				4	6	8	
170	(426)	1			4	6	8	
171	(427)		2		4	6	8	
172	(428)	1	2		4	6	8	
173	(429)			3	4	6	8	
174	(430)	1		3	4	6	8	
175	(431)		2	3	4	6	8	
176	(432)	1	2	3	4	6	8	
177	(433)					5	6	8
178	(434)	1				5	6	8
179	(435)		2			5	6	8
180	(436)	1	2			5	6	8
181	(437)			3		5	6	8
182	(438)	1		3		5	6	8
183	(439)		2	3		5	6	8
184	(440)	1	2	3		5	6	8
185	(441)				4	5	6	8
186	(442)	1			4	5	6	8
187	(443)		2		4	5	6	8
188	(444)	1	2		4	5	6	8
189	(445)			3	4	5	6	8
190	(446)	1		3	4	5	6	8
191	(447)		2	3	4	5	6	8
192	(448)	1	2	3	4	5	6	8
193	(449)						7	8
194	(450)	1					7	8
195	(451)		2				7	8
196	(452)	1	2				7	8
197	(453)			3			7	8
198	(454)	1		3			7	8
199	(455)		2	3			7	8
200	(456)	1	2	3			7	8
201	(457)				4		7	8
202	(458)	1			4		7	8
203	(459)		2		4		7	8
204	(460)	1	2		4		7	8
205	(461)			3	4		7	8
206	(462)	1		3	4		7	8
207	(463)		2	3	4		7	8



208	(464)	1	2	3	4		7	8	
209	(465)					5	7	8	
210	(466)	1				5	7	8	
211	(467)		2			5	7	8	
212	(468)	1	2			5	7	8	
213	(469)			3		5	7	8	
214	(470)	1		3		5	7	8	
215	(471)		2	3		5	7	8	
216	(472)	1	2	3		5	7	8	
217	(473)				4	5	7	8	
218	(474)	1			4	5	7	8	
219	(475)		2		4	5	7	8	
220	(476)	1	2		4	5	7	8	
221	(477)			3	4	5	7	8	
222	(478)	1		3	4	5	7	8	
223	(479)		2	3	4	5	7	8	
224	(480)	1	2	3	4	5	7	8	
225	(481)						6	7	8
226	(482)	1					6	7	8
227	(483)		2				6	7	8
228	(484)	1	2				6	7	8
229	(485)			3			6	7	8
230	(486)	1		3			6	7	8
231	(487)		2	3			6	7	8
232	(488)	1	2	3			6	7	8
233	(489)				4		6	7	8
234	(490)	1			4		6	7	8
235	(491)		2		4		6	7	8
236	(492)	1	2		4		6	7	8
237	(493)			3	4		6	7	8
238	(494)	1		3	4		6	7	8
239	(495)		2	3	4		6	7	8
240	(496)	1	2	3	4		6	7	8
241	(497)					5	6	7	8
242	(498)	1				5	6	7	8
243	(499)		2			5	6	7	8
244	(500)	1	2			5	6	7	8
245	(501)			3		5	6	7	8
246	(502)	1		3		5	6	7	8
247	(503)		2	3		5	6	7	8
248	(504)	1	2	3		5	6	7	8
249	(505)				4	5	6	7	8
250	(506)	1			4	5	6	7	8
251	(507)		2		4	5	6	7	8
252	(508)	1	2		4	5	6	7	8

<b>252</b>	<b>(508)</b>	<b>1</b>	<b>2</b>		<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>253</b>	<b>(509)</b>			<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>254</b>	<b>(510)</b>	<b>1</b>		<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>255</b>	<b>(511)</b>		<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>256</b>	<b>(512)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>

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